Head and Neck

Professor Salah Al-Marashi

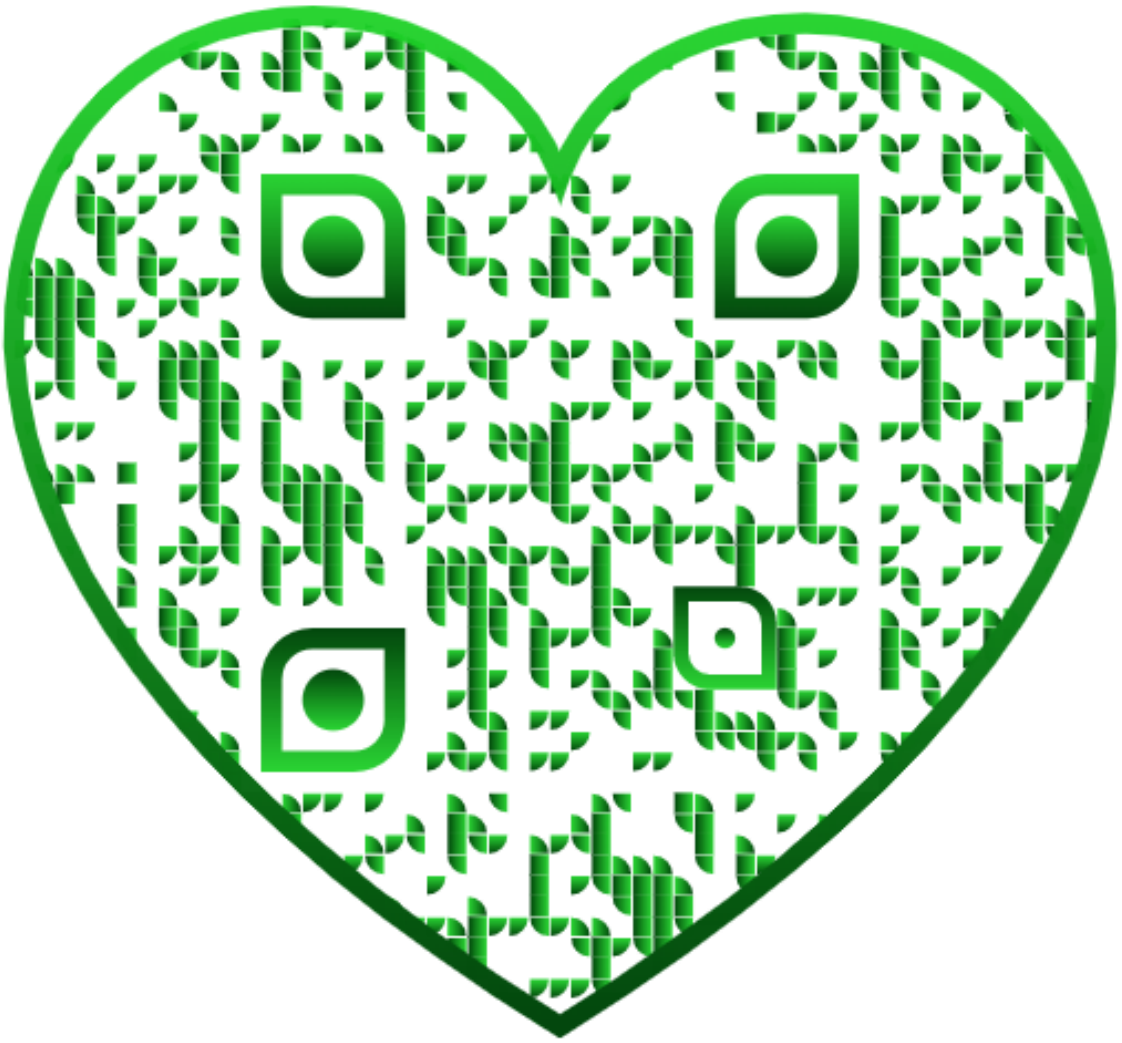
This book is dedicated to my family, who has always supported me through my academic endeavors. Without their support, the successes that I have achieved today would not have been possible. I would like to thank them all starting with my wife and followed by my children:

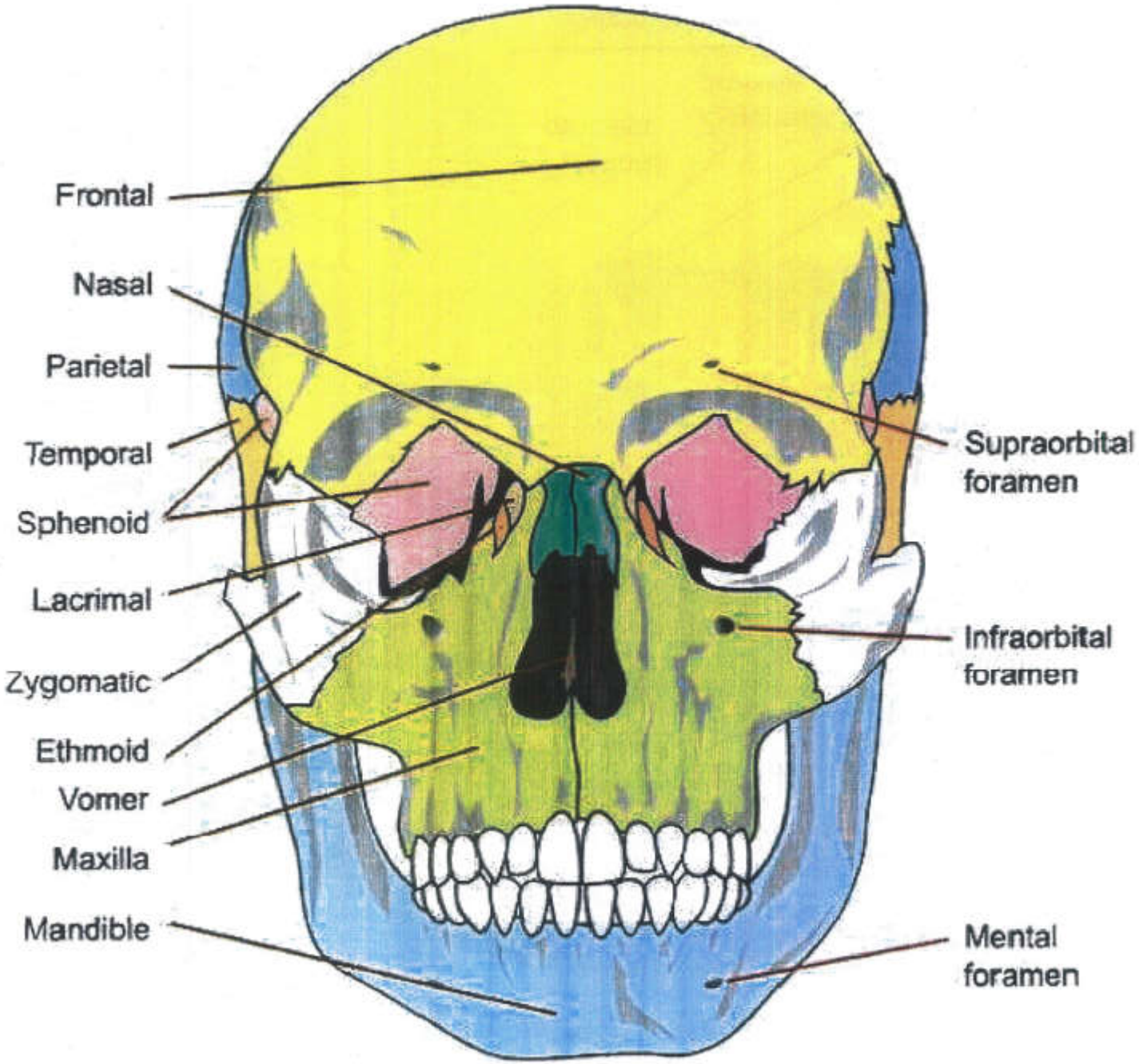
Dr. Chhaya

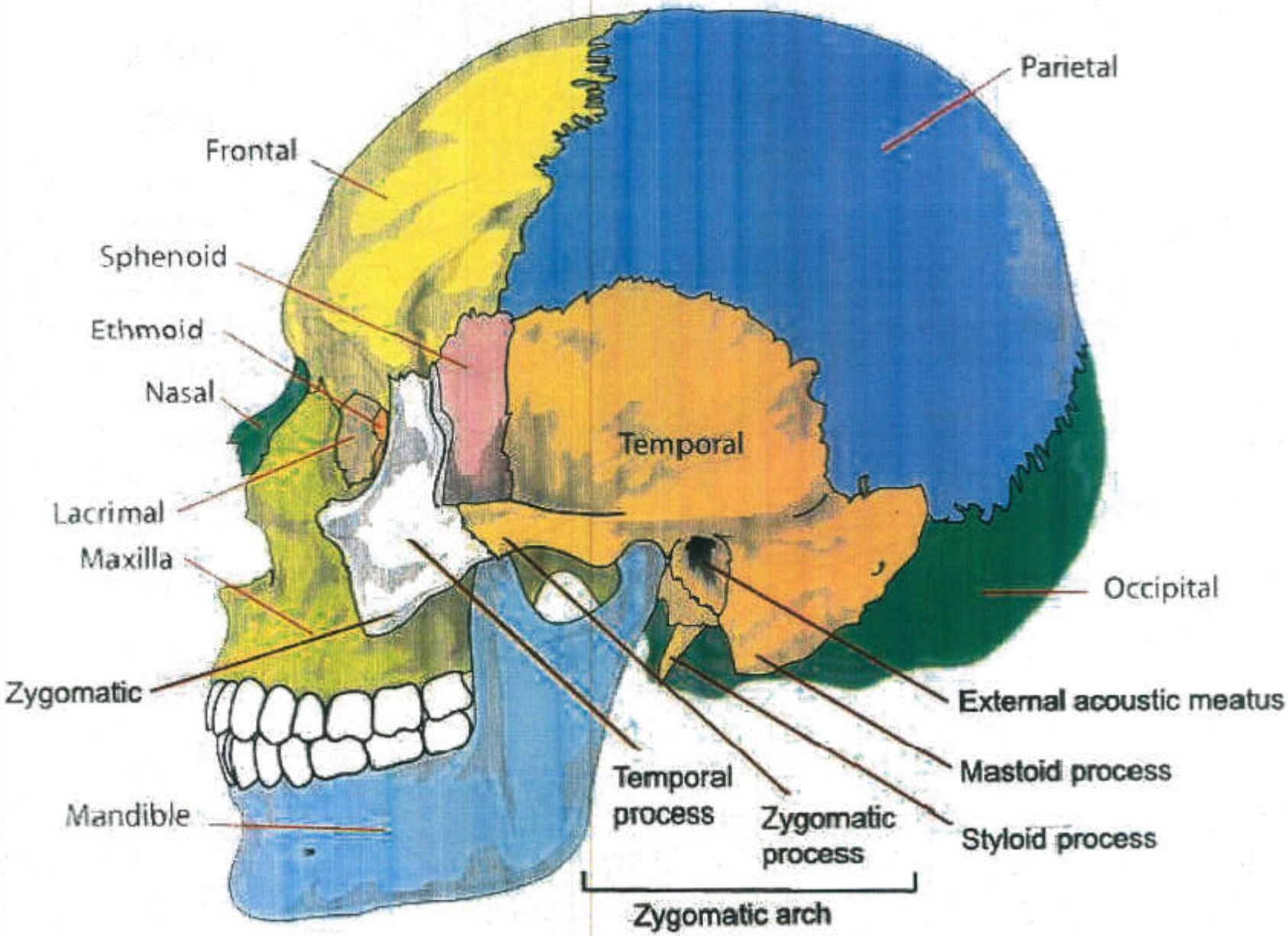
Dr. Abdulkhalique

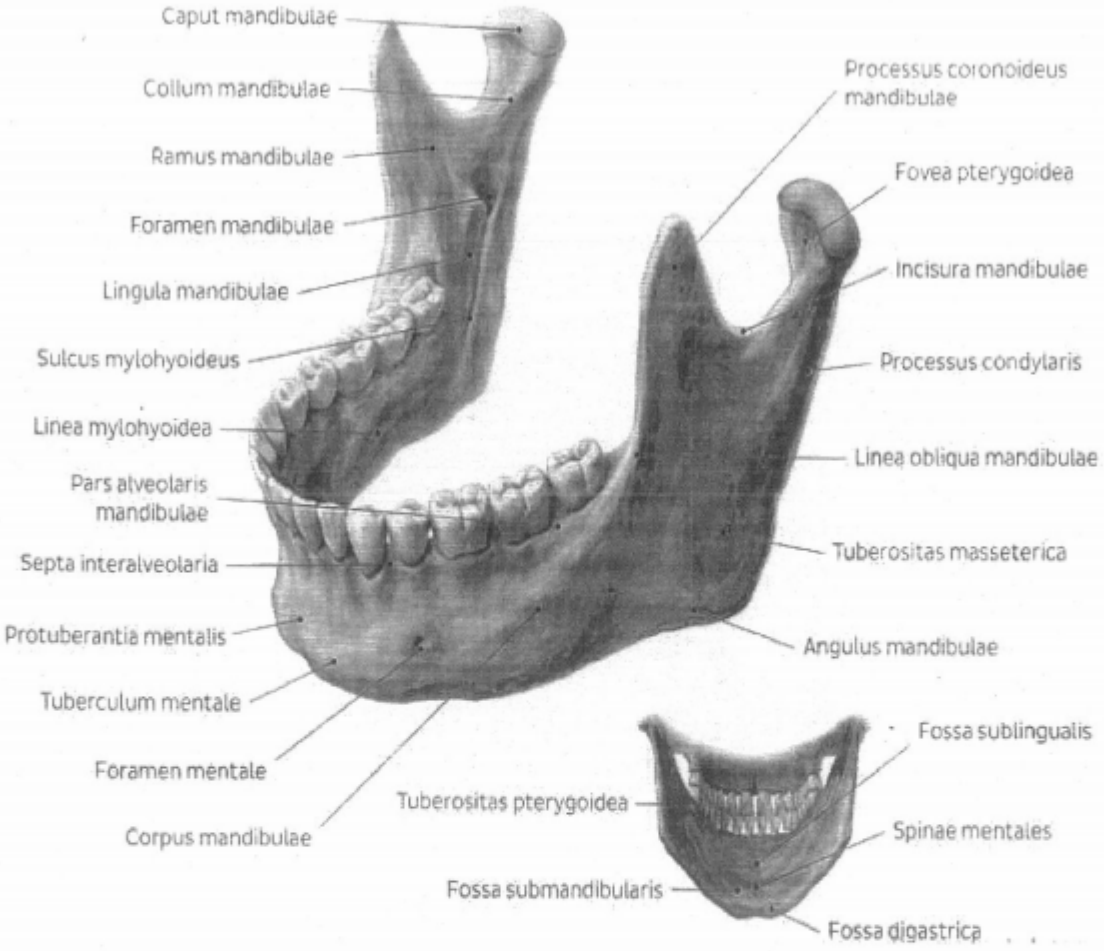
Dr. Dina

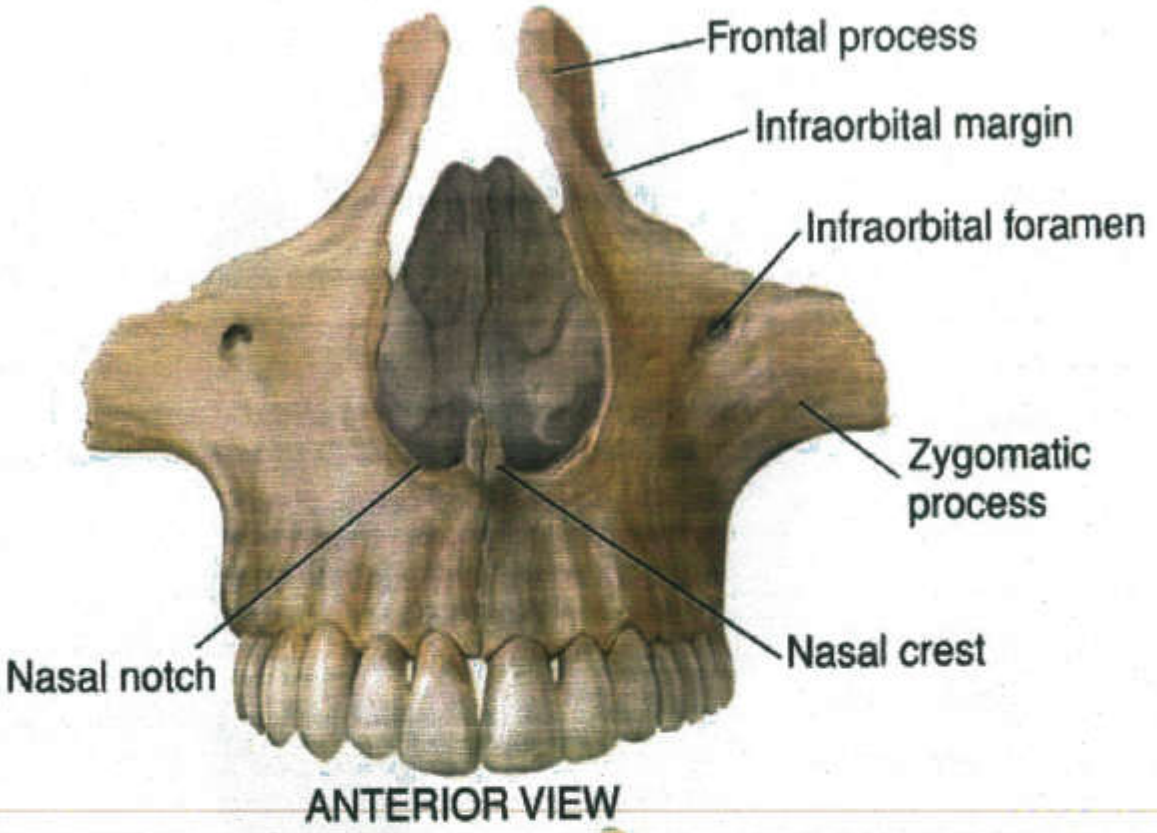
Dr. Khalid



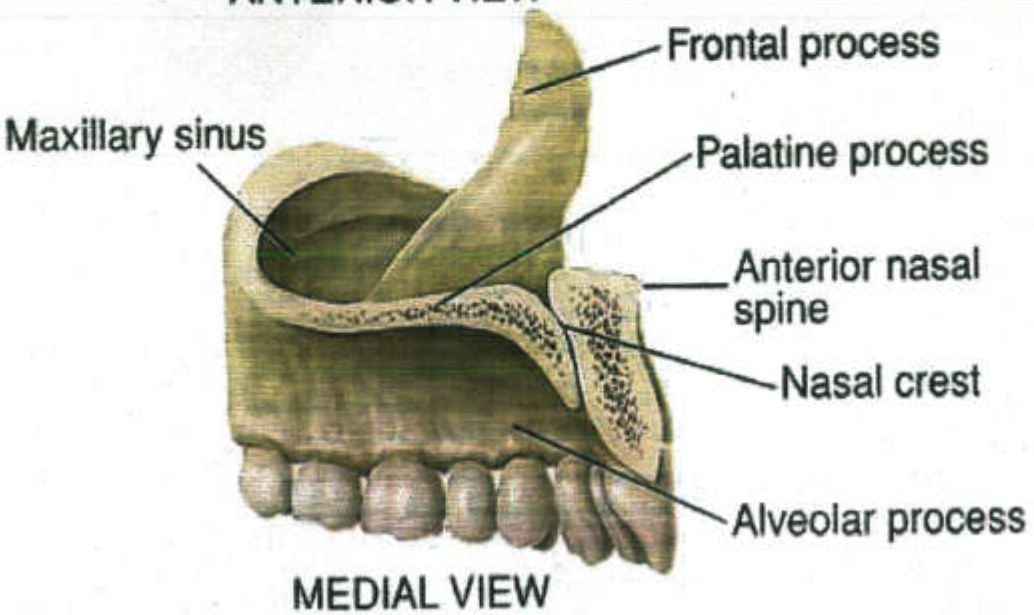

Frontal
Nasal
Parietal
Temporal
Sphenoid
Lacrimal
Zygomatic
Ethmoid
Vomer
Maxilla
Mandible
Supraorbital foramen
Infraorbital foramen
Mental foramen


Parietal
Frontal
Sphenoid
Ethmoid
Nasal
Temporal
Lacrimal
Maxilla
Occipital
Zygomatic
External acoustic meatus
Mastoid process
Temporal process
Zygomatic process
Styloid process
Mandible
Zygomatic arch


Caput mandibulae
Collum mandibulae
Ramus mandibulae
Foramen mandibulae
Lingula mandibulae
Sulcus mylohyoideus
Linea mylohyoidea
Pars alveolaris mandibulae
Septa interalveolaria
Protuberantia mentalis
Tuberculum mentale
Foramen mentale
Corpus mandibulae
Processus coronoideus mandibulae
Fovea pterygoidea
Incisura mandibulae
Processus condylaris
Linea obliqua mandibulae
Tuberositas masseterica
Angulus mandibulae
Fossa sublingualis
Tuberositas pterygoidea
Spinae mentales
Fossa submandibularis
Fossa digastrica

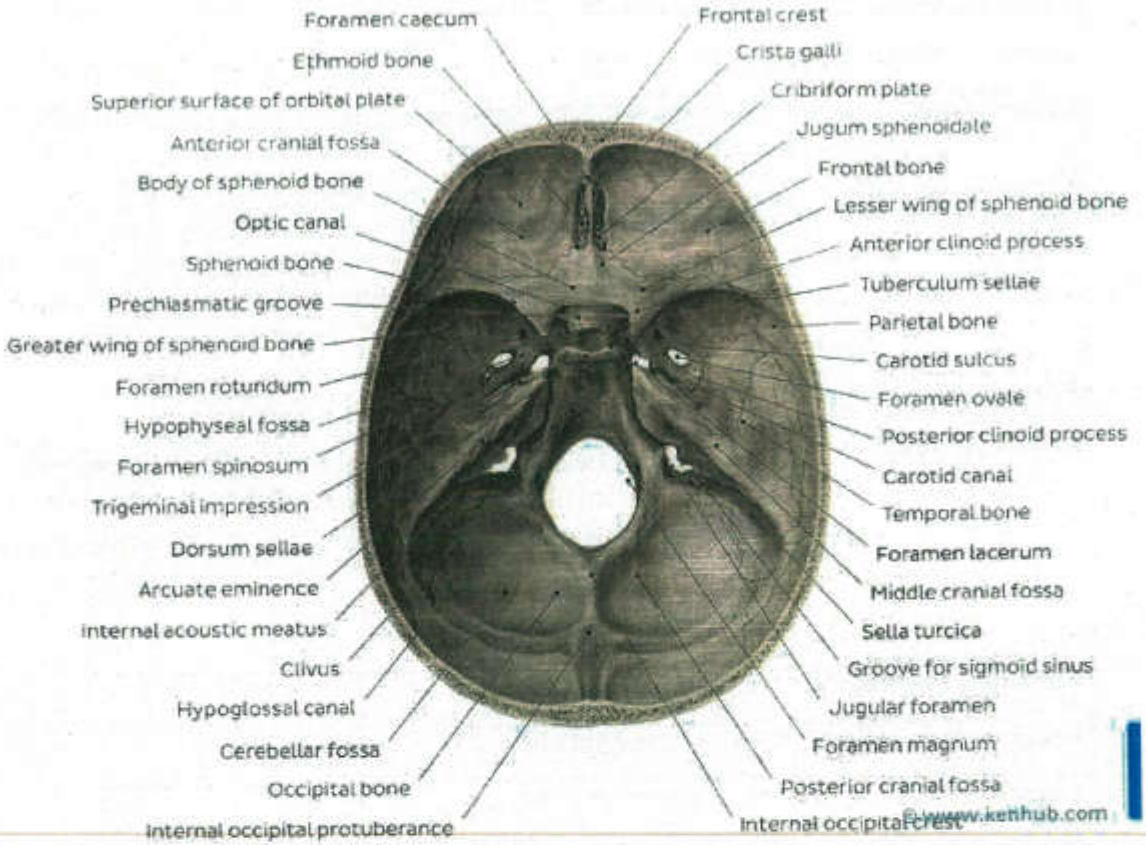


ANTERIOR VIEW



MEDIAL VIEW

Foramen caecum	Emissary veins
Olfactory foramina	Olfactory nerve
Optic canal	Optic nerve (CNII), ophthalmic artery, dural sheath of optic nerve
Superior orbital fissure	superior and inferior divisions of oculomotor nerve (III), trochlear nerve (IV), lacrimal, frontal and nasociliary branches of ophthalmic (V1), abducens nerve (VI), superior and inferior divisions of ophthalmic vein, inferior division also passes through the inferior orbital fissure, sympathetic fibers from cavernous plexus.
Foramen rotundum	Maxillary division of the trigeminal nerve (CN V2)
Foramen ovale	mandibular nerve, a branch of the trigeminal nerve. accessory meningeal artery. lesser petrosal nerve, a branch of the glossopharyngeal nerve. an emissary vein connecting the cavernous sinus with the pterygoid plexus of veins.
Foramen spinosum	Middle meningeal artery
Foramen lacerum	Greater petrosal nerve
Carotid canal	Internal carotid artery
Internal acoustic foramen	Facial nerve (CNVII), Vestibulocochlear nerve (CNVIII)
Jugular foramen	Glossopharyngeal nerve (CNIX), vagus nerve (CNX), descending portion of the spinal accessory nerve (CNXI), internal jugular vein
Hypoglossal canal	Hypoglossal nerve (CNXII)
Foramen magnum	Apart from the transmission of the medulla oblongata and its membranes, the **foramen magnum** transmits the vertebral arteries, the anterior and posterior spinal arteries, the tectorial membranes and alar ligaments. It also transmits the accessory nerve into the skull.


Foramen caecum
Ethmoid bone
Superior surface of orbital plate
Anterior cranial fossa
Body of sphenoid bone
Optic canal
Sphenoid bone
Prechiasmatic groove
Greater wing of sphenoid bone
Foramen rotundum
Hypophyseal fossa
Foramen spinosum
Trigeminal impression
Dorsum sellae
Arcuate eminence
Internal acoustic meatus
Clivus
Hypoglossal canal
Cerebellar fossa
Occipital bone
Internal occipital protuberance
Frontal crest
Crista galli
Cribriform plate
Jugum sphenoidale
Frontal bone
Lesser wing of sphenoid bone
Anterior clinoid process
Tuberculum sellae
Parietal bone
Carotid sulcus
Foramen ovale
Posterior clinoid process
Carotid canal
Temporal bone
Foramen lacerum
Middle cranial fossa
Sella turcica
Groove for sigmoid sinus
Jugular foramen
Foramen magnum
Posterior cranial fossa
Internal occipital crest
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MUSCLES OF THE FACE

MUSCLES AROUND THE EYES:

1.) Orbicularis Oculi

a.) Palpebral Part:

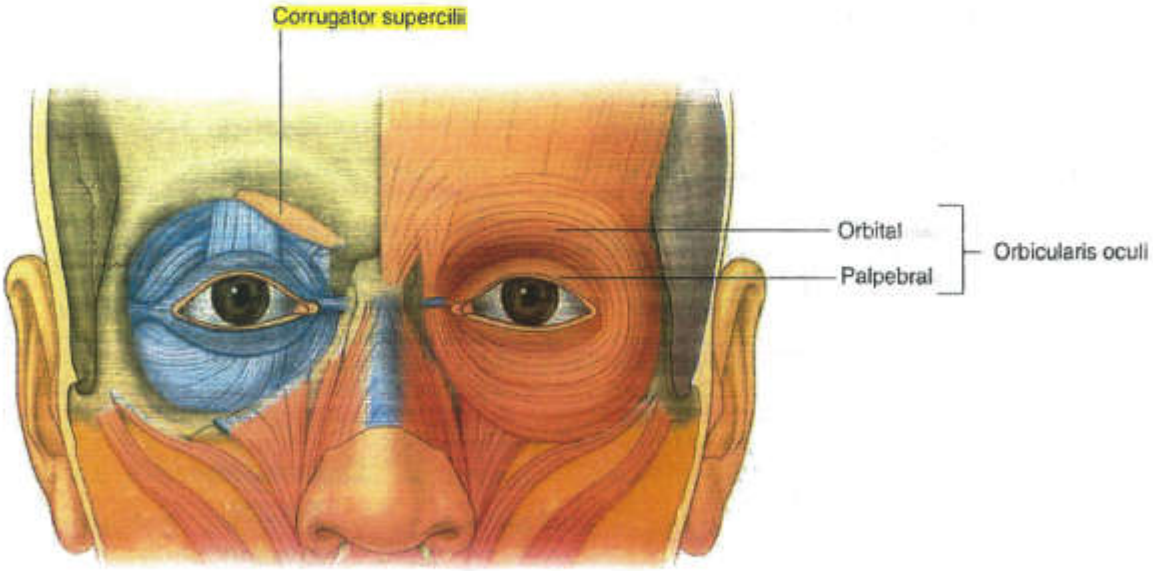
- **Origin:** medial palpebral ligament.
- **Insertion:** lateral palpebral raphe.
- **Nerve Supply:** facial nerve.
- **Function:** Closes the eyelids gently.

b.) Orbital Part:

- **Origin:** nasal part of frontal bone, frontal process of maxilla, and medial palpebral ligament.
- **Insertion:** fibers from uninterrupted ellipse around orbit.
- **Nerve Supply:** facial nerve.

2.) Corrugator Super Cilli:

- **Origin:** medial end of the supercillary arch.
- **Insertion:** skin of medial half of the eyebrow.
- **Nerve Supply:** facial nerve.
- **Action:** draw the eyebrows medially and downward.



Muscles around the Nose:

1.) Nasalis Muscle:

a.) Transverse part:

- **Origin:** maxilla just lateral to nose.
- **Insertion:** aponeurosis across doursuim of nose with muscle fiber from the other side.
- **Function:** compresses nasal aperture.

b.) Alar part:

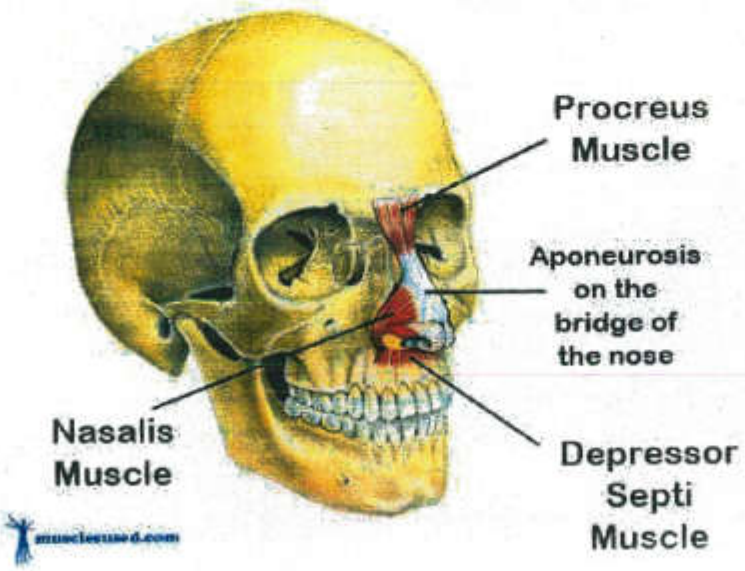
- **Origin:** maxilla over lateral incisor.
- **Insertion:** alar cartilage of nose.
- **Function:** draws cartilage downwards and laterally.

2.)Procerus:

- **Origin:** nasal bone and upper part of lateral cartilage.
- **Insertion:** skin of lower forehead between eyebrows.
- **Nerve Supply:** facial nerve.

3.) Depressor Septti

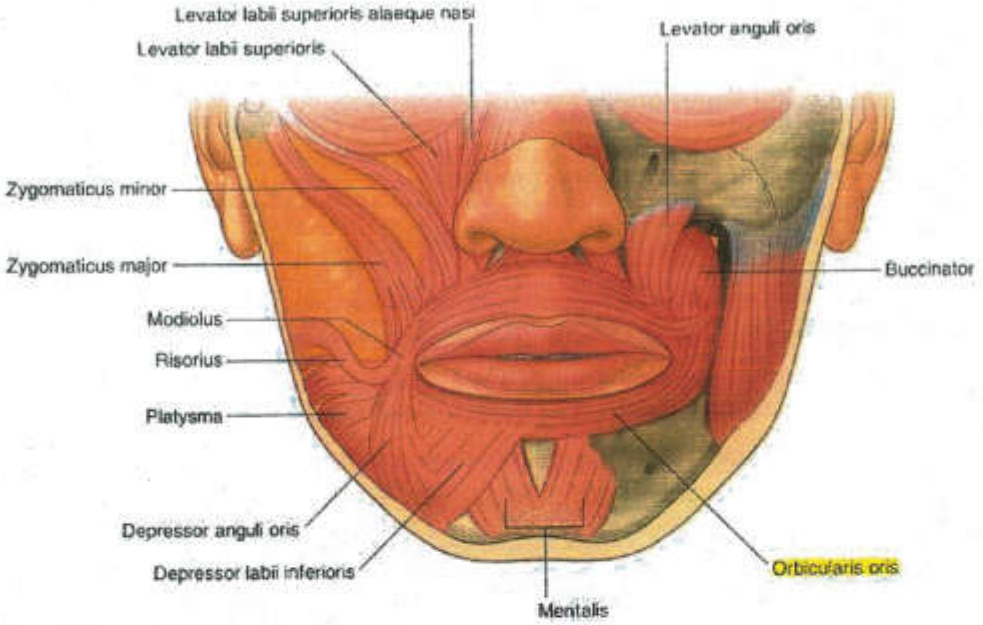
- **Origin:** maxilla above medial Insisor.
- **Insertion:** mobile part of nasal septum.
- **Nerve Supply:** facial nerve.



MUSCLE AROUND THE MOUTH:

1.) Depressor anguli oris
2.) Depressor labii inferioris
3.) Mentalis
4.) Zygomatic major
5.) Zygomatic minor
6.) Levatorla lbii superiorus
7.) Risorius
8.) Levator labil superioris ala eque nasi
9.) Levator anguli oris
10.)Orbicularis oris
11.) Buccinators.

Muscle around the mouth



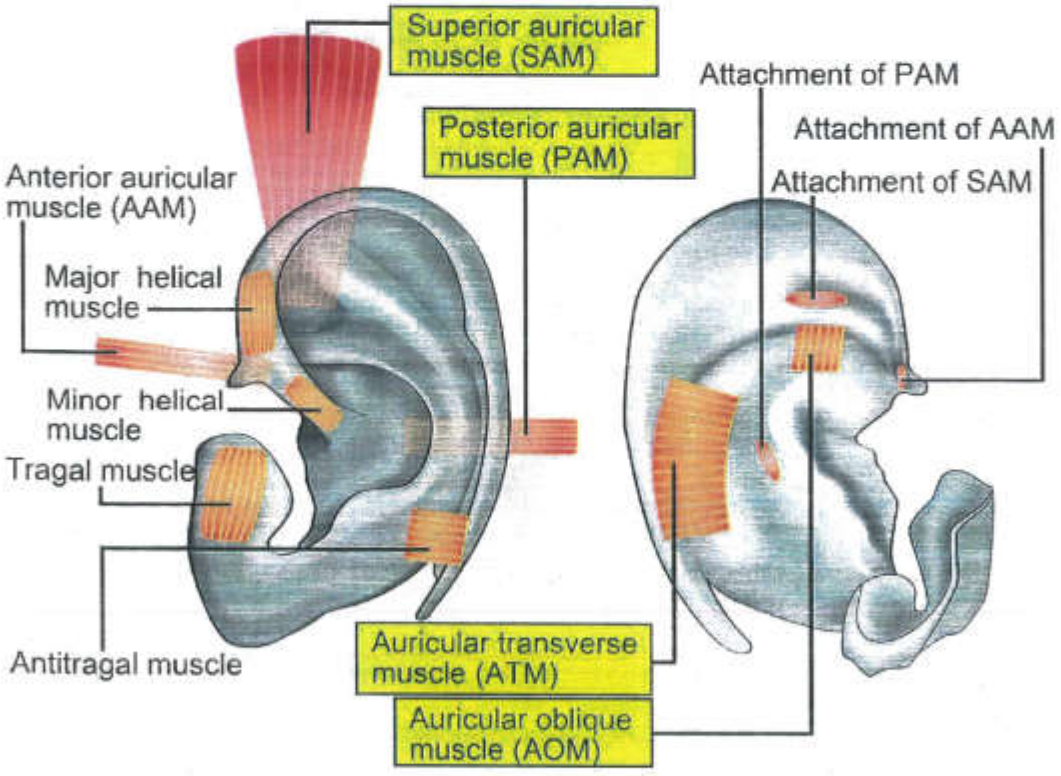
MUSCLES AROUND THE AURICLE:

There are three extrinsic auricle muscles:

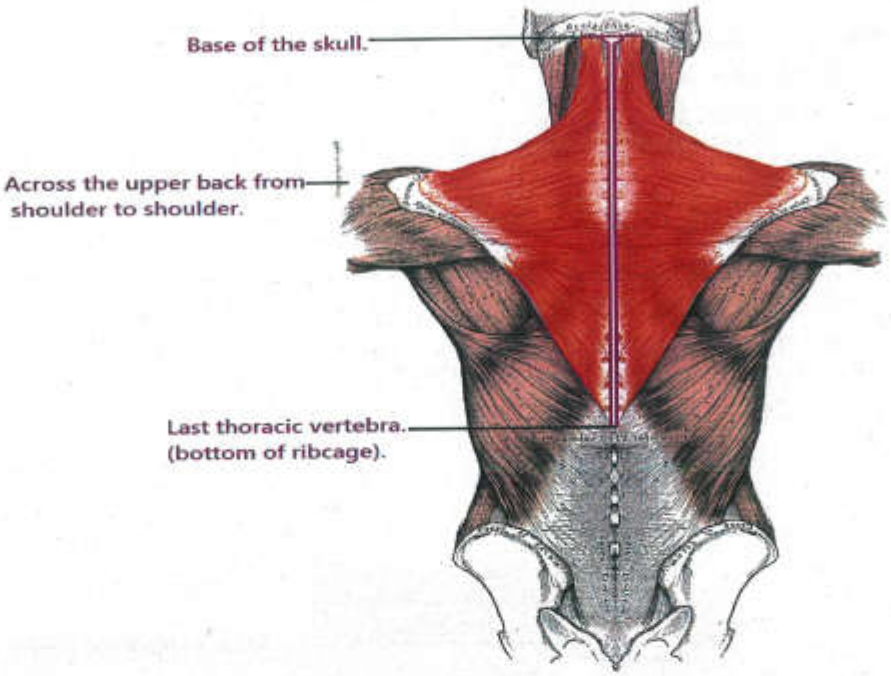
1. Posterior Muscle
2. Anterior Muscle
3. Superior Muscle

There are 6 intrinsic muscles:

1. Helicis Major Muscle
2. Helicis Minor Muscle
3. Tragicus Muscle
4. Anti-tragicus Muscle
5. Transverse Muscle
6. Oblique Muscle



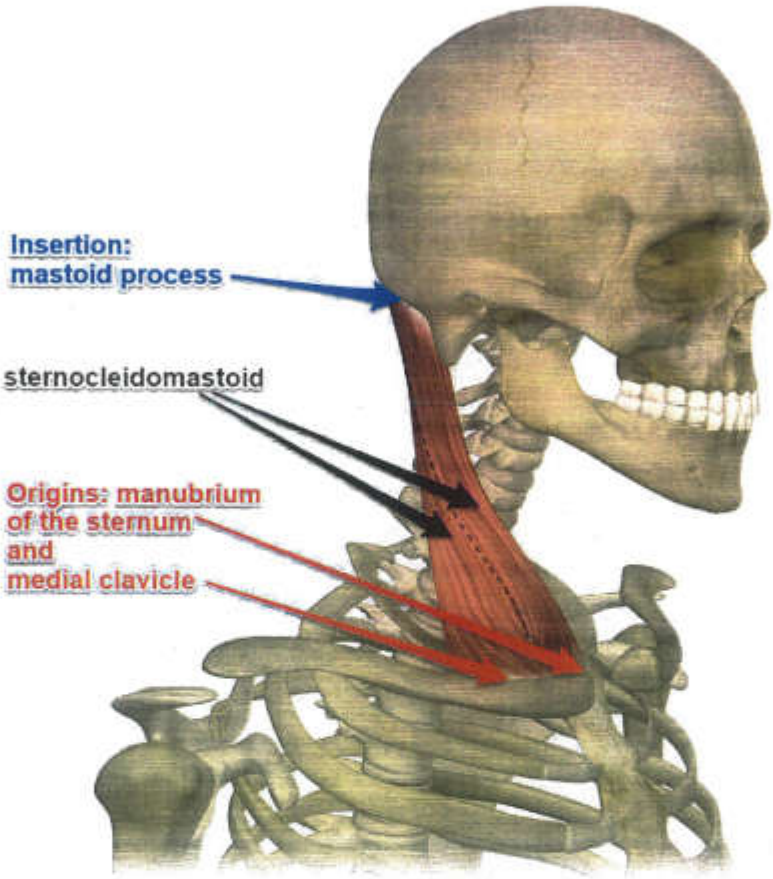
Trapezius Muscle



The Trapezius Muscles.

Trapezius Muscle	
Origin	Extends from 3 areas: 1. Back of skull from medial 1/3 of superior nuchal line and the external occipital protuberance. 2. Back of the neck from ligamentum nuchae and spine of C7. 3. Back of thorax: all thoracic spines.
Insertion	V-shaped origin opposite of Deltoid Muscle. 1. Upper fiber is inserted to posterior aspect of lateral 1/3 of clavical. 2. Middle fiber is inserted into medial border of acromion upper lip of the crest of spine of the scapula. 3. Lower fibers ascend to be inserted into the tubercle of the crest of spine of the scapula.
Nerve Supply	1. Motor: spinal accessory nerve. 2. Sensory: "Proprioceptive" branch from C3 and C4.
Action	1. Upper fiber: elevate scapula and shoulder 2. Middle fibers: retract scapula. 3. Lower fibers: retract the scapula, the glenoid cavity facing upward.

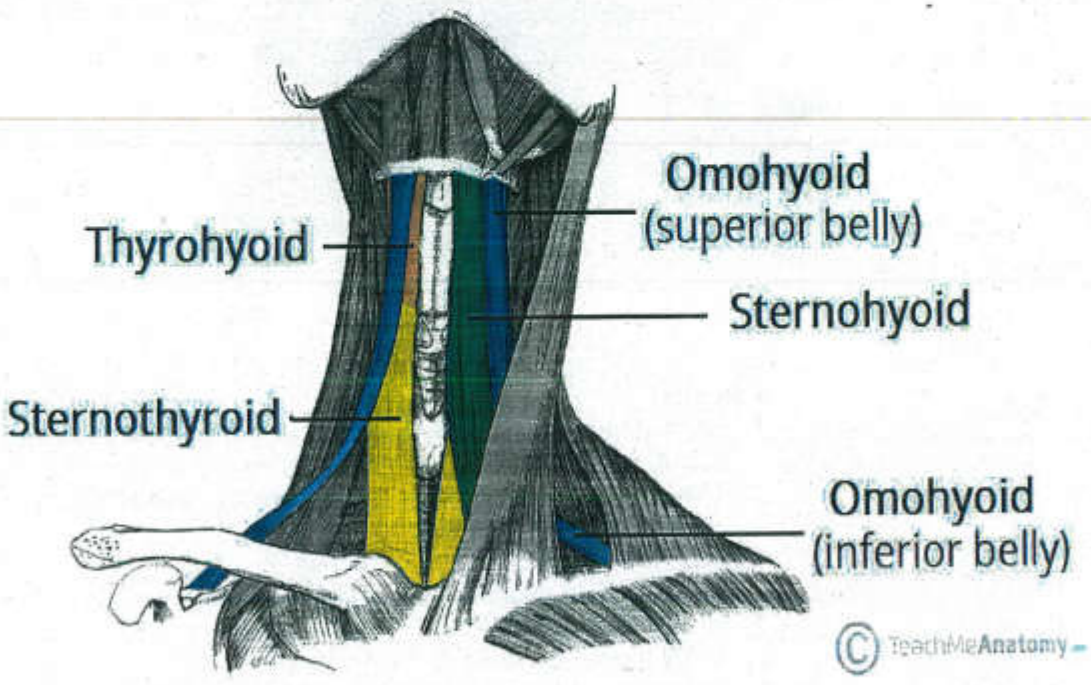
Sternomastoid Muscle



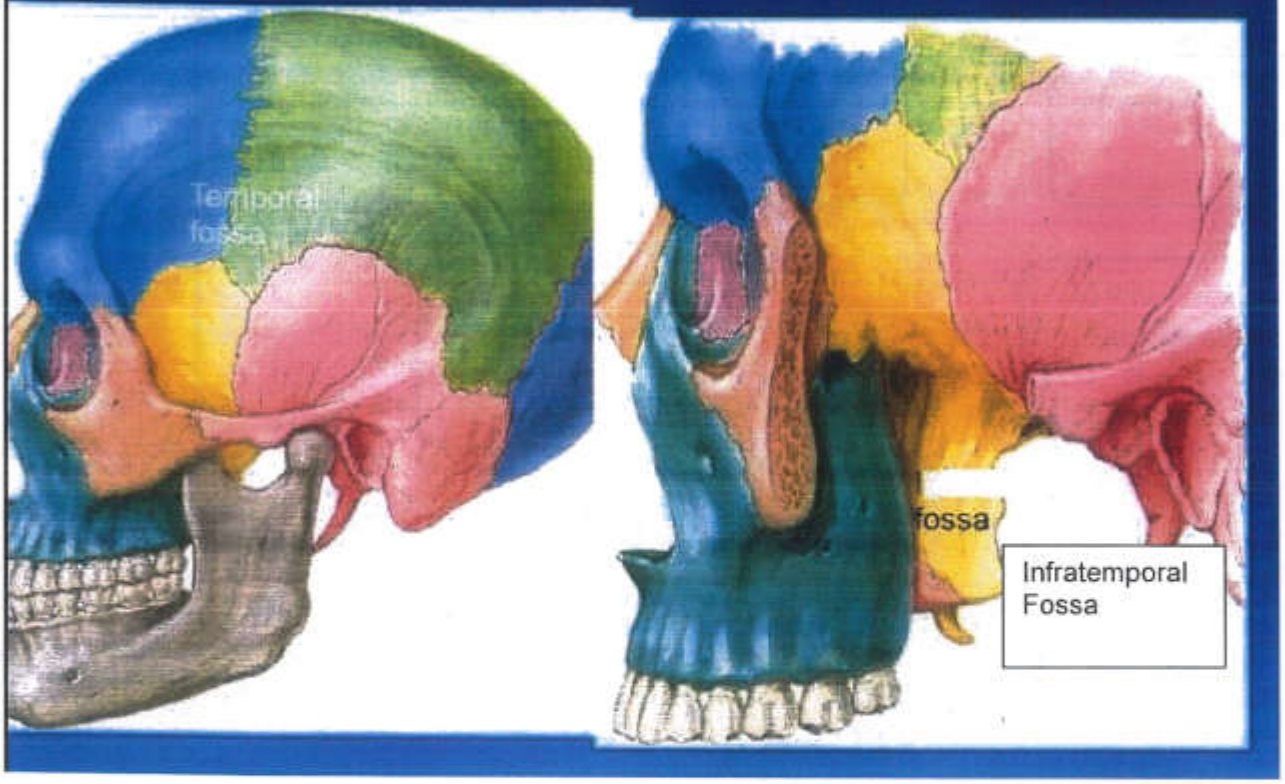
Sternomastoid Muscle	
Origin	**2 Heads:** 1. Sternal head: rounded tendon from the front of manubrium sterni. 2. Clavecular head: flat flashy head from the medial 1/3 of upper surface of clavicle.
Insertion	1. Lateral surface of Mastoid Process 2. Lateral 1/3 of superior nuchal line.
Nerve Supply	1. Spinal Accessory Nerve "motor" 2. Branch from C2 and C3 "Proprioceptive"
Action	1. When one muscle contract it binds the head towards it's same side. 2. When the 2 muscles contract-the neck flexes.

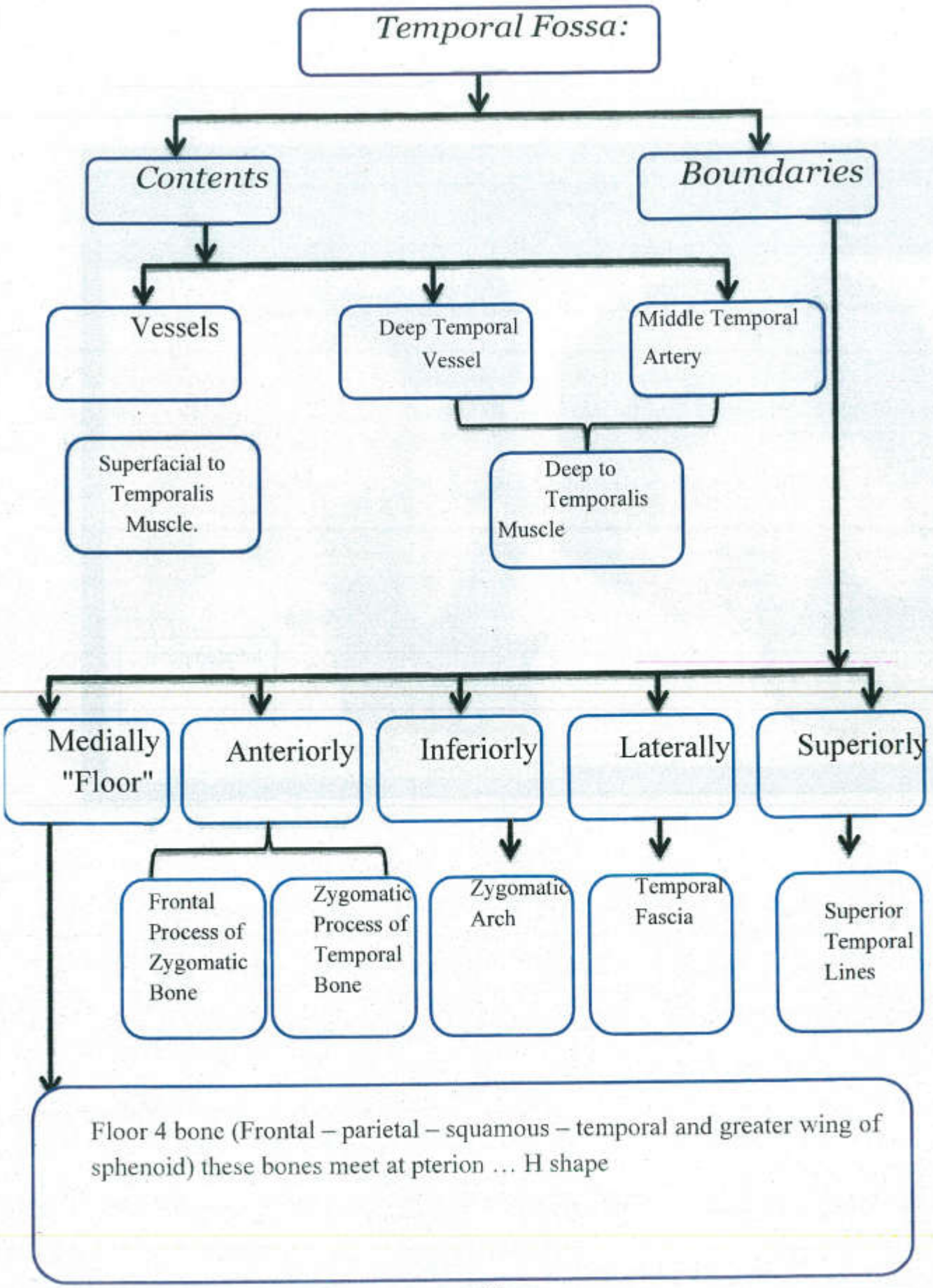
Sternohyoid and Sternothyroid Muscles

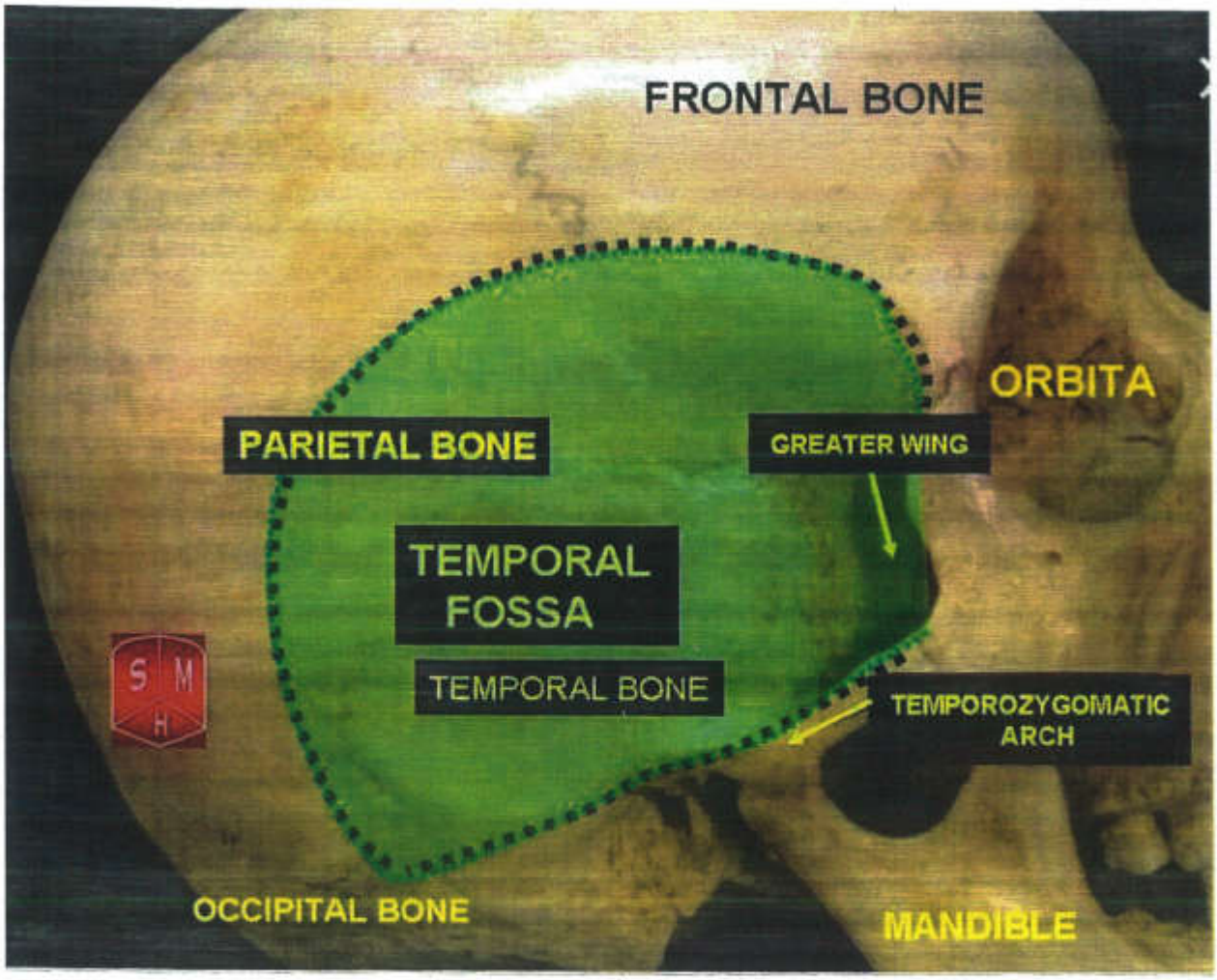
Name of Muscles	Origin	Insertion	Nerve Supply	Action
Sternohyoid Muscle	Back of manubrium and medial end of Clavicle	Lower border of body of hyoid alongside the middle line.	Ansa Cervicalis	1. Depression of hyoid bone after deglutition. 2. Fixation of hyoid bone during movement of tongue.
Sternothyroid Muscle	Oblique line of thyroid cartilage.	Lower border of the body and the greater horn of hyoid bone.	Nerve to Thyrohyoid branch from hypoglossal nerve, buts its fibers are derived from C1.	Pulls the larynx upwards hyoid bone in the 1st page of deglutition.

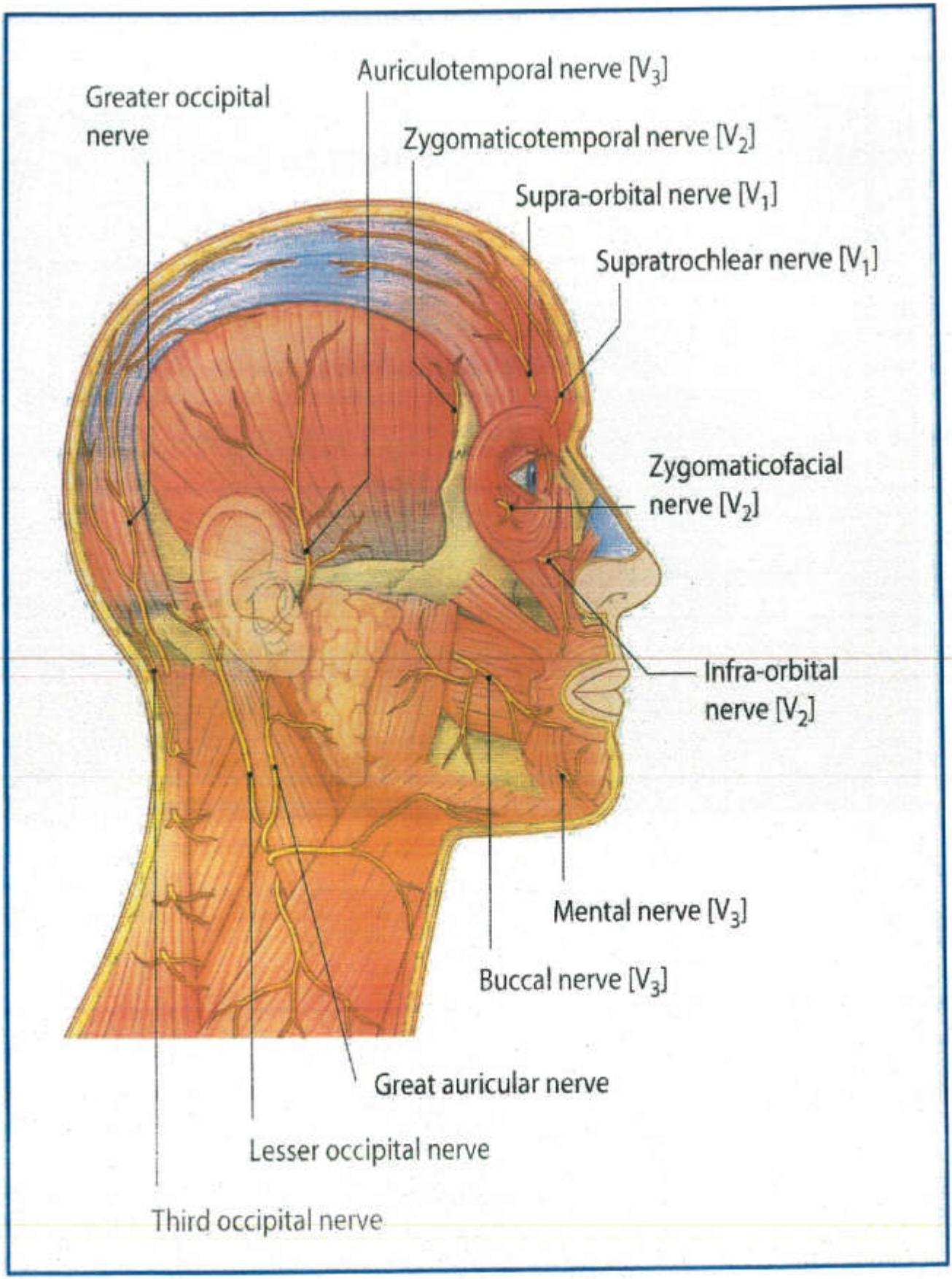


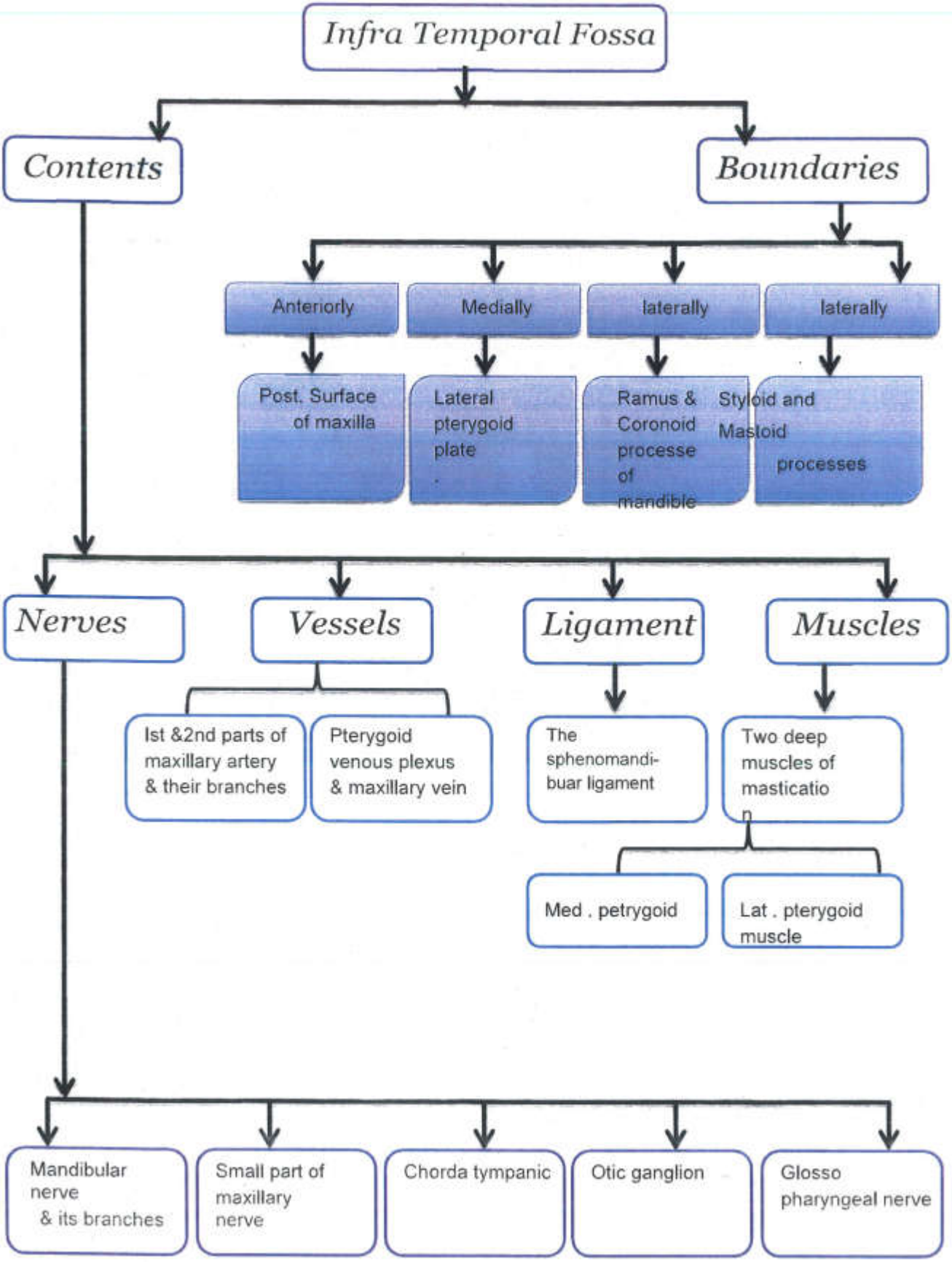
TEMPORAL &
INFERATEMPORAL FOSSA

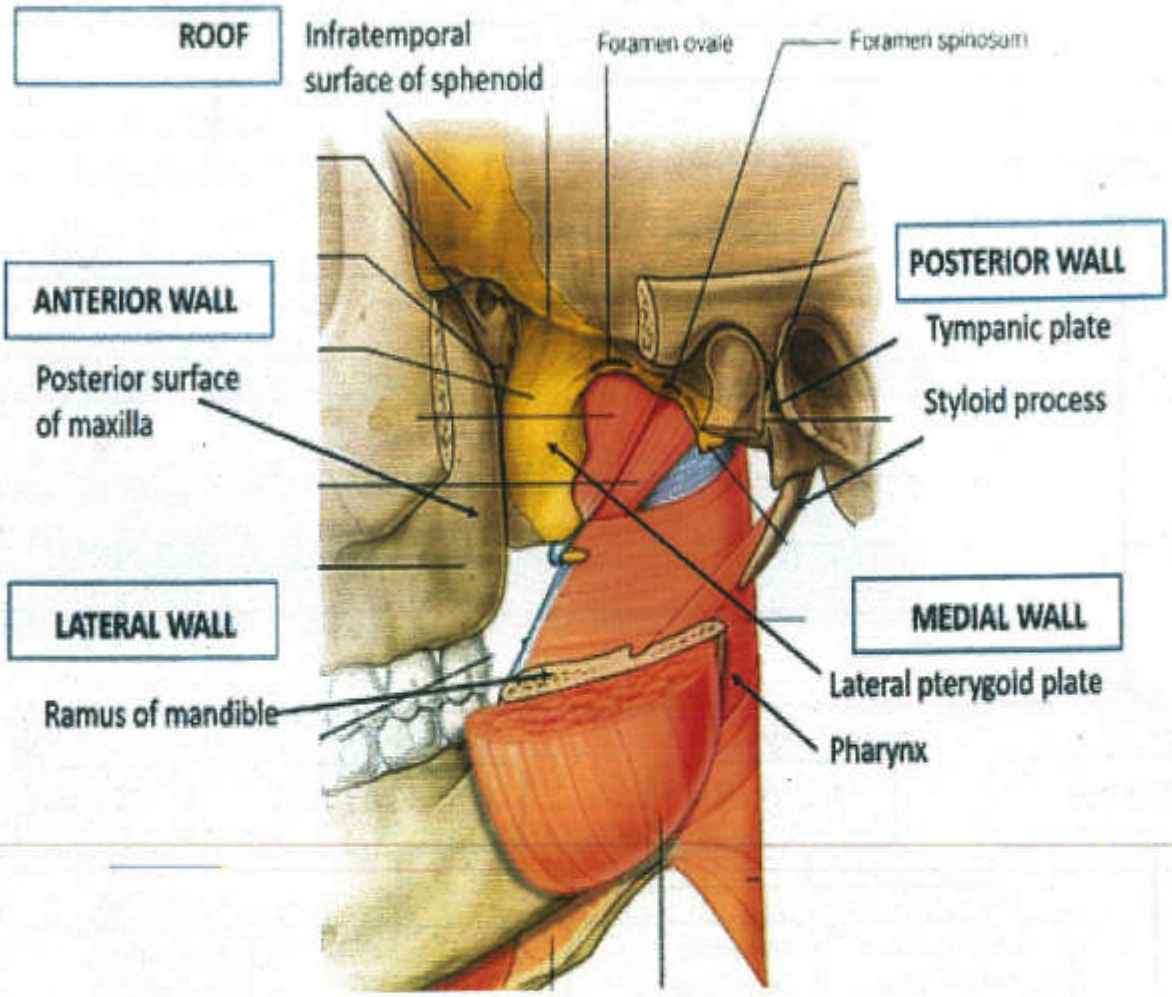



Temporal Fossa:
Contents
Boundaries
Vessels
Deep Temporal Vessel
Middle Temporal Artery
Superfacial to Temporalis Muscle.
Deep to Temporalis Muscle
Medially "Floor"
Anteriorly
Inferiorly
Laterally
Superiorly
Frontal Process of Zygomatic Bone
Zygomatic Process of Temporal Bone
Zygomatic Arch
Temporal Fascia
Superior Temporal Lines
Floor 4 bone (Frontal – parietal – squamous – temporal and greater wing of sphenoid) these bones meet at pterion … H shape


FRONTAL BONE
ORBITA
PARIETAL BONE
GREATER WING
TEMPORAL FOSSA
TEMPORAL BONE
TEMPOROZYGOMATIC ARCH
OCCIPITAL BONE
MANDIBLE


Auriculotemporal nerve [V3]
Greater occipital nerve
Zygomaticotemporal nerve [V2]
Supra-orbital nerve [V1]
Supratrochlear nerve [V1]
Zygomaticofacial nerve [V2]
Infra-orbital nerve [V2]
Mental nerve [V3]
Buccal nerve [V3]
Great auricular nerve
Lesser occipital nerve
Third occipital nerve


Infra Temporal Fossa
Contents
Boundaries
Anteriorly
Medially
laterally
laterally
Post. Surface of maxilla
Lateral pterygoid plate
Ramus & Coronoid processe of mandible
Styloid and Mastoid processes
Nerves
Vessels
Ligament
Muscles
Ist &2nd parts of maxillary artery & their branches
Pterygoid venous plexus & maxillary vein
The sphenomandi-buar ligament
Two deep muscles of masticatio n
Med . petrygoid
Lat . pterygoid muscle
Mandibular nerve & its branches
Small part of maxillary nerve
Chorda tympanic
Otic ganglion
Glosso pharyngeal nerve


ROOF
Infratemporal surface of sphenoid
Foramen ovale
Foramen spinosum
ANTERIOR WALL
Posterior surface of maxilla
POSTERIOR WALL
Tympanic plate
Styloid process
LATERAL WALL
Ramus of mandible
MEDIAL WALL
Lateral pterygoid plate
Pharynx

THE TEMPOROMANDIBULAR JOINT

The **temporomandibular joint** (TMJ) is formed by the articulation of the mandible and the temporal bone of the cranium. It is located anteriorly to the tragus of the ear, on the lateral aspect of the face.

In this article, we shall look at the anatomy of the temporomandibular joint – its articulating surfaces, ligaments and clinical correlations.

Articulating Surfaces

The temporomandibular joint consists of articulations between **three** surfaces; the mandibular fossa and articular tubercle (from the squamous part of the **temporal bone**), and the head of mandible.

This joint has a unique mechanism; the articular surfaces of the bones never come into contact with each other – they are separated by an **articular disk**. The presence of such a disk splits the joint into **two** synovial joint cavities, each lined by a synovial membrane. The articular surface of the bones are covered by **fibrocartilage**, not hyaline cartilage.

Ligaments

There are three **extracapsular** ligaments. They act to stablise the temporomandibular joint.

- **Lateral ligament** – runs from the beginning of the articular tubule to the mandibular neck. It is a thickening of the joint capsule, and acts to prevent posterior dislocation of the joint.
- **Sphenomandibular ligament** – originates from the sphenoid spine, and attaches to the mandible.
- **Stylomandibular ligament** – a thickening of the fascia of the parotid gland. Along with the facial muscles, it supports the weight of the jaw.

Movements

Movements at this joint are produced by the muscles of mastication, and the hyoid muscles. The two divisions of the temporomandibular joint have different functions.

Protrusion and Retraction

The upper part of the joint allows **protrusion and retraction** of the mandible – the anterior and posterior movements of the jaw.

The **lateral pterygoid muscle** is responsible for protrusion (assisted by the medial pterygoid), and the posterior fibres of the temporalis perform retraction. A lateral movement (i.e. for chewing and grinding) is achieved by alternately protruding and retracting the mandible on each side.

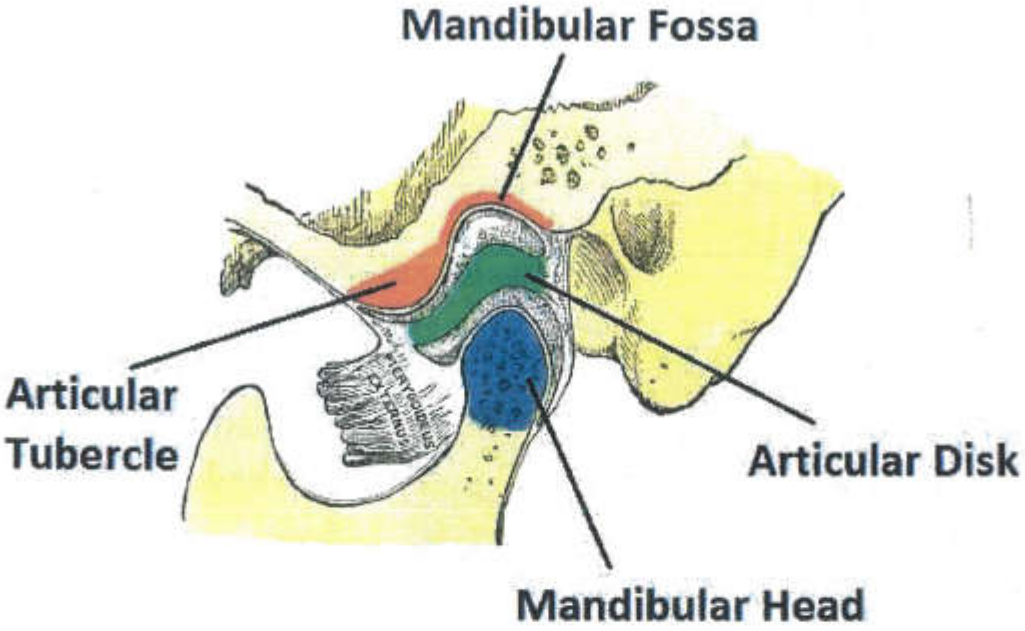
Elevation and Depression

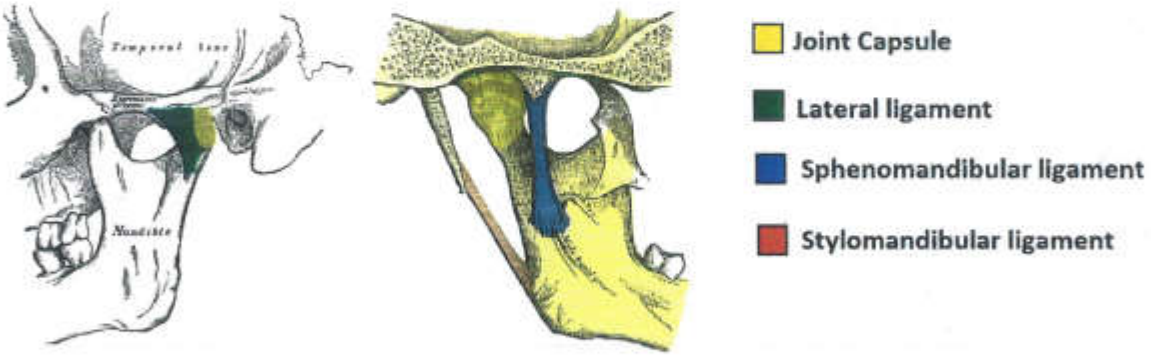
The lower part of the joint permits elevation and depression of the mandible; opening and closing the mouth. Depression is mostly caused by **gravity.** However, if there is resistance, the digastric, geniohyoid, and mylohyoid muscles assist. Elevation is very **strong** movement, caused by the contraction of the temporalis, masseter, and medial pterygoid muscles.

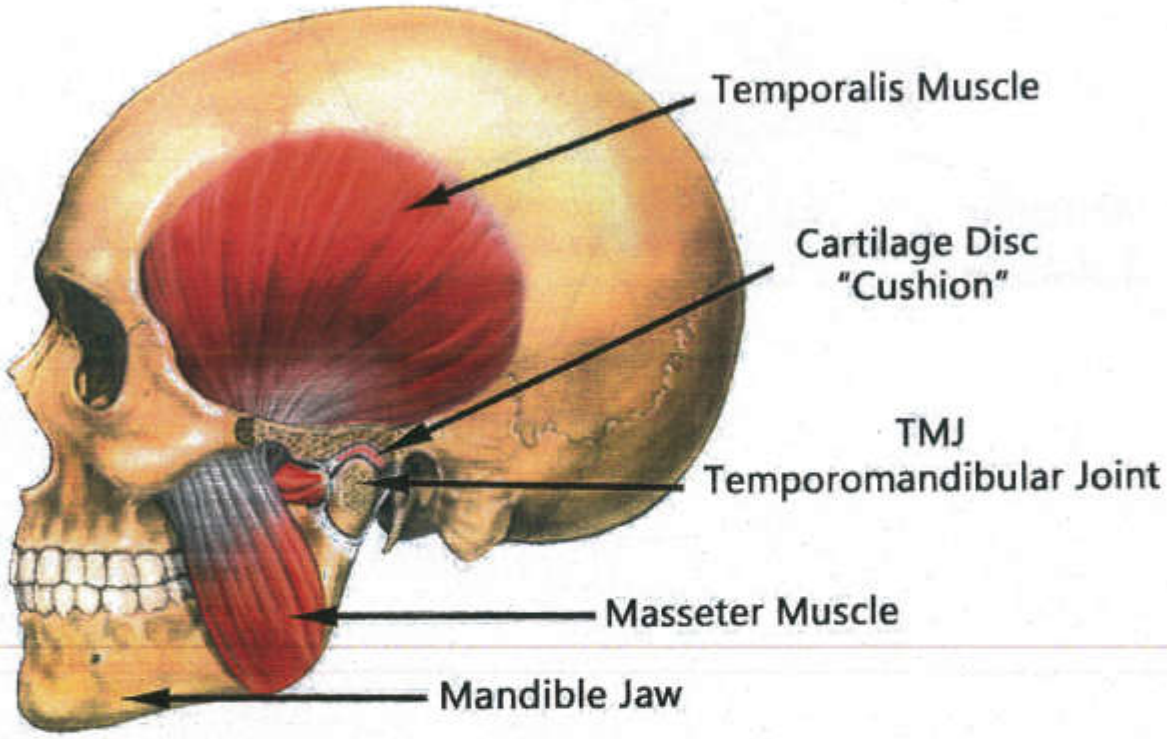
Neurovascular supply

The arterial supply to the TMJ is provided by the branches of the **external carotid**, principally the **superficial temporal branch**. Other contributing branches include the deep auricular, ascending pharyngeal and maxillary arteries.

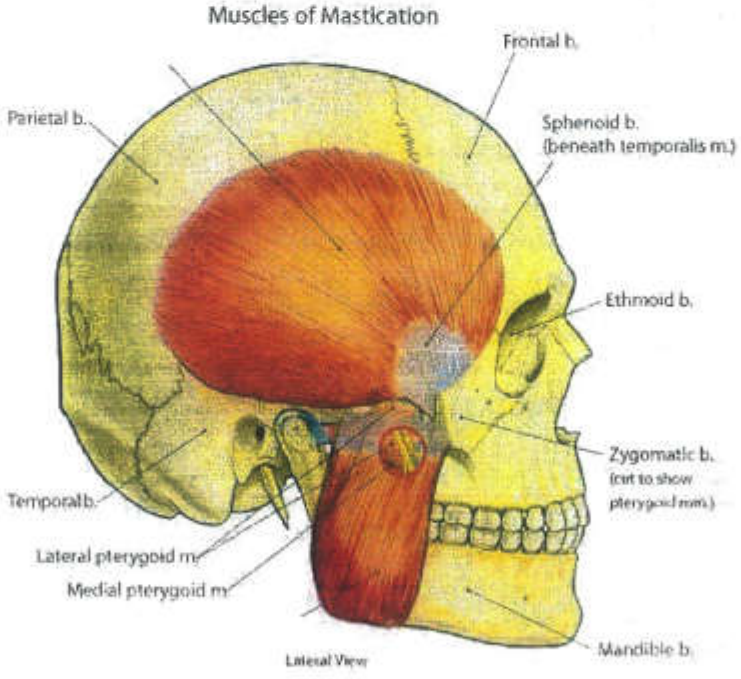
The TMJ is innervated by the **auriculotemporal** and **masseteric** branches of the mandibular nerve (CN V3).


Mandibular Fossa
Articular Tubercle
Articular Disk
Mandibular Head


Joint Capsule
Lateral ligament
Sphenomandibular ligament
Stylomandibular ligament


Temporalis Muscle
Cartilage Disc
"Cushion"
TMJ
Temporomandibular Joint
Masseter Muscle
Mandible Jaw

Muscle	Origin	Insertion	Description
Masseter	Zygomatic arch	Mandible (external surface)	Closes jaw; flat, thick muscle
Temporalis	Temporal bone	Coronoid process at the anterior border of the ramus	Closes jaw; fan-shaped
Medial pterygoid	Sphenoid, palatine, and maxillary bones	Inner (medial) surface of the ramus	Closes jaw; parallels masseter muscle
Lateral pterygoid	Sphenoid bone	Anterior surface of mandibular condyle	Opens jaw; allows grinding action side to side, and protrudes the mandible
Buccinator	Alveolar process of maxilla	From the alveolar processes of maxilla and mandible	It holds the cheek to the teeth and assists with chewing



Blood Supply of the Head and Neck

1. Common Carotid Artery
2. Subclavian Artery

} Branches of the Aortic Arch

The External Carotid Artery gives off the following branches:

- **Anteriorly:**

1.) **Superior Thyroid:**

- Supplies the larynx and thyroid gland.

2.) **Lingual:**

- Supplies the tongue and sublingual gland.

3.) **Facial:**

- Supplies the face, palate, tonsil, and submaxillary gland

- **Posteriorly:**

4.) **Occipital:**

- Supplies the sternomastoid muscle and back of the scalp.

5.) **Posterior auricular:**

- Supplies the back of the ear and the adjacent part of the scalp.

- **Terminal Branches:**

6.) **Superficial Temporal:**

- Supplies the scalp in front of the ear and, by its transverse facial branch, to the back part of the face.

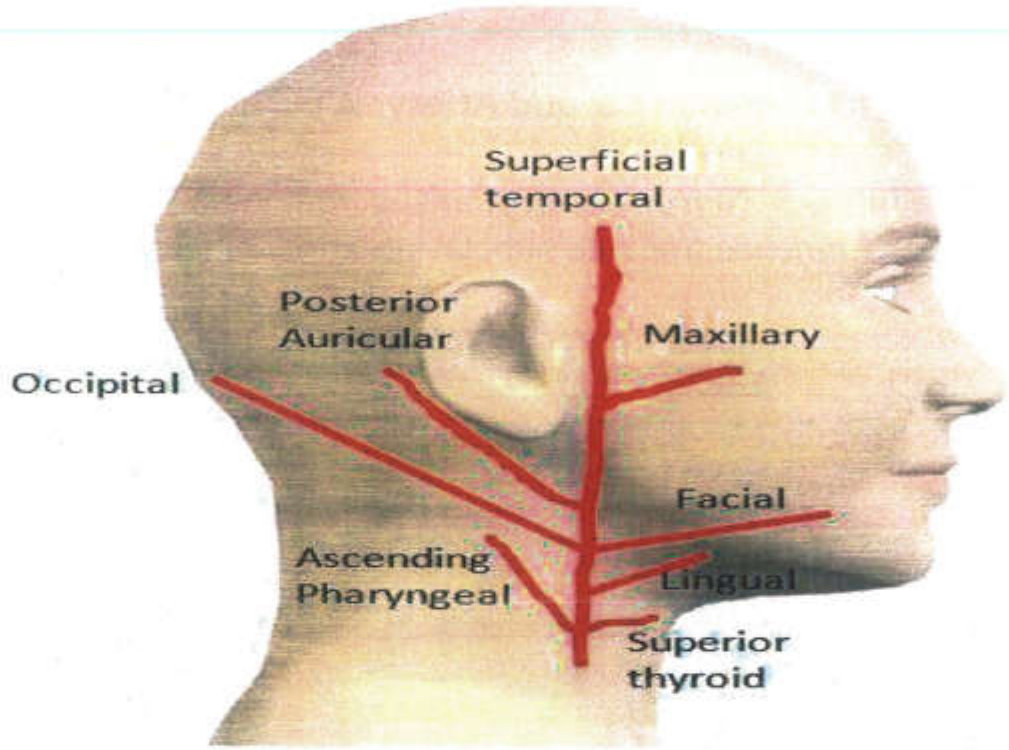
7.) **Maxillary Artery:**

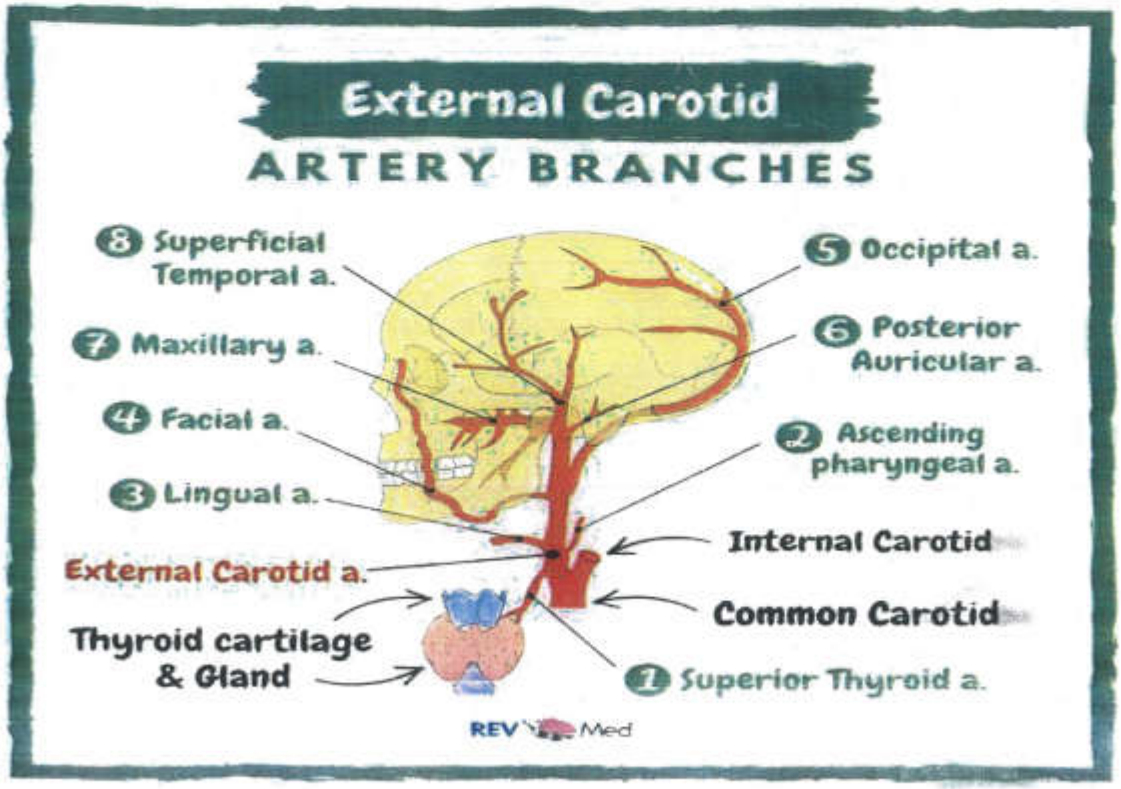
- Giving muscular branches to the muscles of mastication, meningeal to the dura mater, dental to the teeth, and other branches to the nose, palate, and tympanum.

- **Ascending Branch from Medial Aspect:**

8.) **Ascending Pharyngeal Artery:**

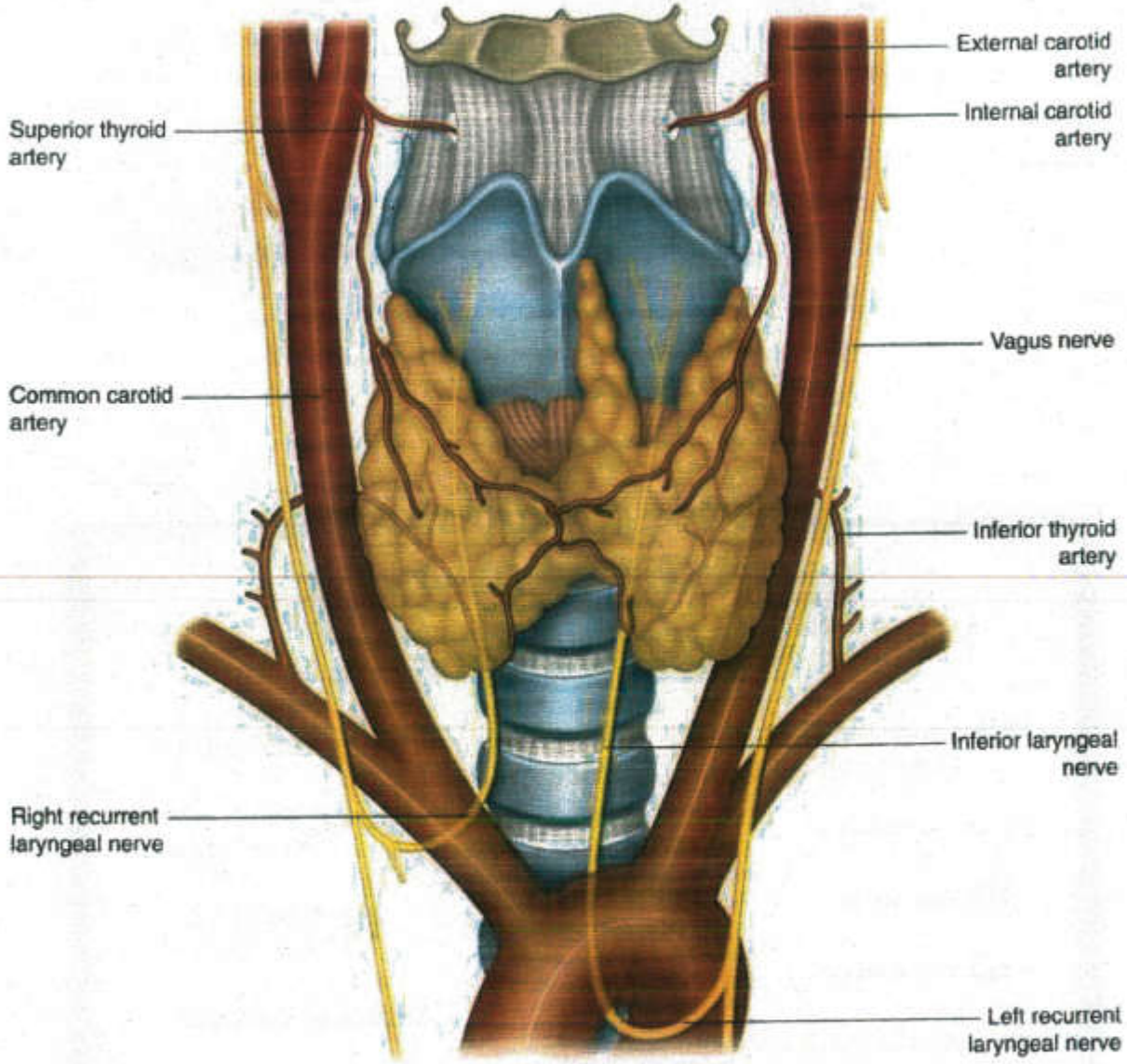
- Supplies the pharynx, palate, tonsils, and dura mater.


Superficial temporal
Posterior Auricular
Maxillary
Occipital
Facial
Ascending Pharyngeal
Lingual
Superior thyroid


External Carotid
ARTERY BRANCHES
8 Superficial Temporal a.
7 Maxillary a.
4 Facial a.
3 Lingual a.
External Carotid a.
Thyroid cartilage & Gland
5 Occipital a.
6 Posterior Auricular a.
2 Ascending pharyngeal a.
Internal Carotid
Common Carotid
1 Superior Thyroid a.
REV Med

Note:

- **External Common Carotid Artery:** is the most important artery of the head and neck.
- **The Inferior Thyroid Artery:** arises from the thyrocervical trunk, which branches from the subclavian artery of the aorta.



Facial Artery

Branches in the Neck

- **Origin:** from external carotid artery.
- **Course:** it ascends deep to the neck of the mandible, and then it curves upwards crossing the angle of masseter to reach the face.
    - Facial Artery is divided into 2 parts (cervical and facial)
- **Branches from the Cervical part:**
    - Tonsillar Artery
    - Ascending Palatine Artery
    - Glandular branches—to supply submandibular gland
    - Segmental Artery—to supply sublingual gland
- **Branches from facial part**
    - Superior Labial Artery
    - Inferior Labial Artery
    - Lateral Nasal—supplies lateral wall of nasal cavity

Maxillary Artery

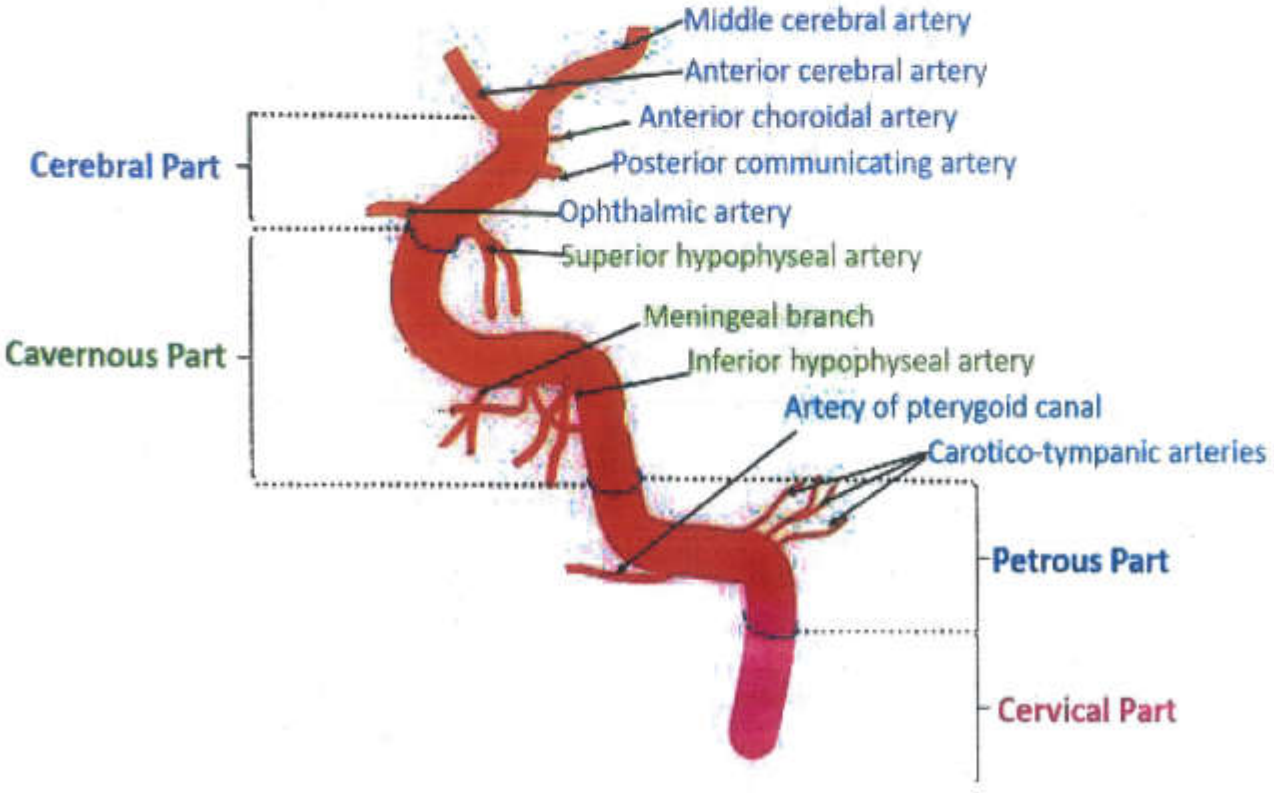
- It's one of the anterior branches of External Carotid Artery.
- **Origin:** arises within the parotid gland, it's the largest of the 2 terminal branches of the E.C.A.
- **Course and branches:** it has 3 parts
  - **1st part: runs within the parotid gland**
    - Middle Meningeal Artery
    - Inferior Alveolar Artery
    - Accessary Meningeal Artery
    - Deep Auricular Artery
    - Anterior Tympanic Artery
  - **2nd part: runs along the lateral surface of lower head of lateral Pterygoid muscle.** (5 muscular branches)
    - Masseter Artery—to masseter muscle
    - Deep Temporal Artery—to temporalis
    - Branch to lateral Pterygoid Muscle
    - Branch to medial Pterygoid Muscle
    - Buccal artery
  - **3rd part: passes through pterygomaxillary fissure to reach the pterygopalatine fossa---maxillary artery ends by becoming the infraorbital artery.**
    - 2-3 Lesser Palatine Artery
    - Posterior Superior Dental Artery
    - Greater Palatine Artery
    - Sphenopalatine Artery
    - Pharyngeal Branch
    - Artery of Pterygoid canal
- **Branches from the Infraorbital Artery**
  - Orbital Branches
  - Anterior Superior Dental Artery
  - **Terminal Branches:**
    - Palpebral branch
    - Nasal branch
    - Labial branch

Internal Carotid Artery ICA

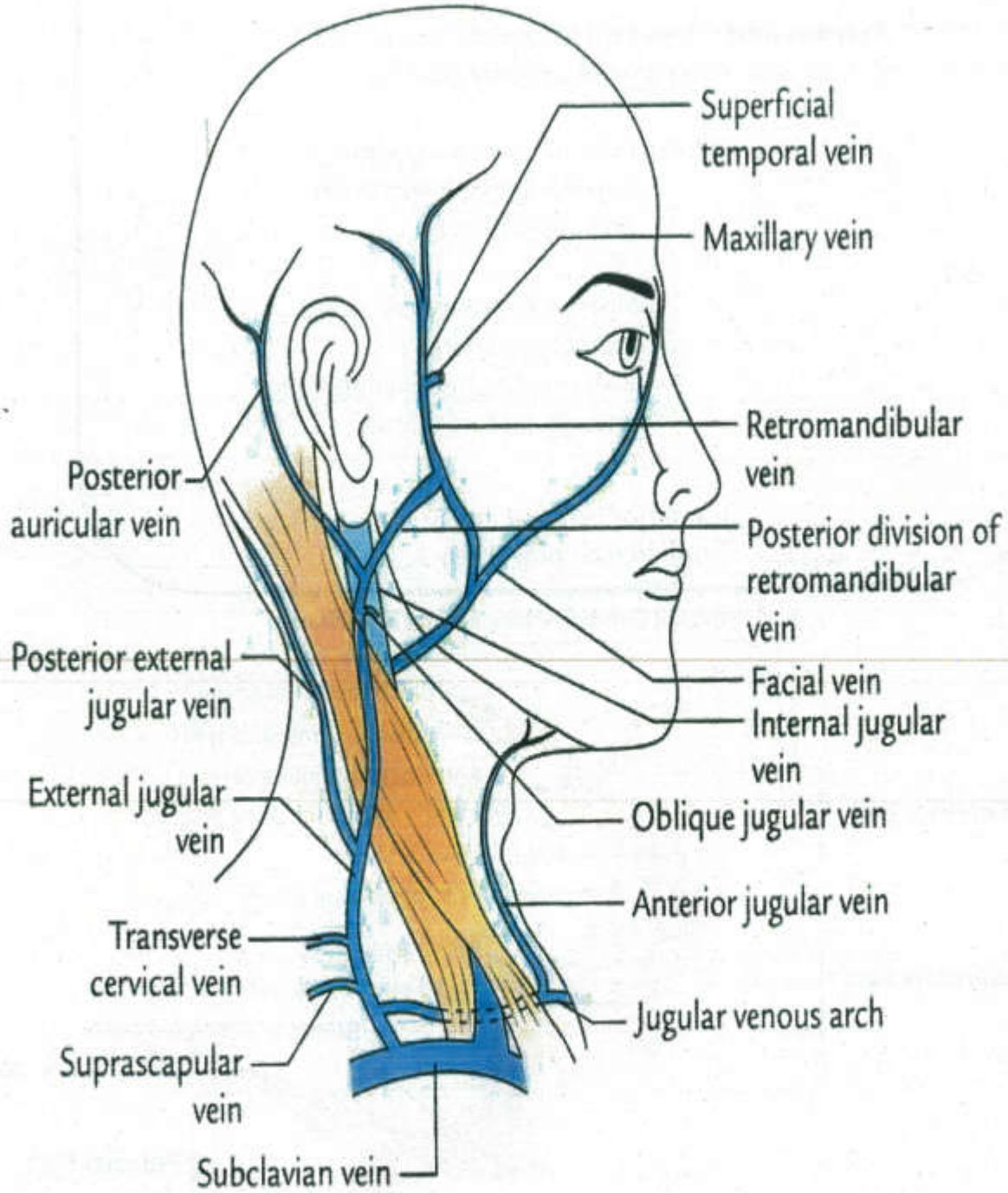
- 1st part:
  - **Cervical part-no branch.**
- 2nd part:
  - **Petrous part:** 1-petrygoid branch.
    2- carticotympanic branch
- 3rd part:
  - **cavernous part (branch to cavernous sinus);**
    1- Inferior hypophyseal artery
    2- Meningeal artery
- 4th part:
  1- superior hypophyseal artery
  2- ophthalmic artery
  3- posterior communicating artery
  4- anterior choroidal artery
- Terminal part:

1-anterior cerebral artery
2-middle cerebral artery

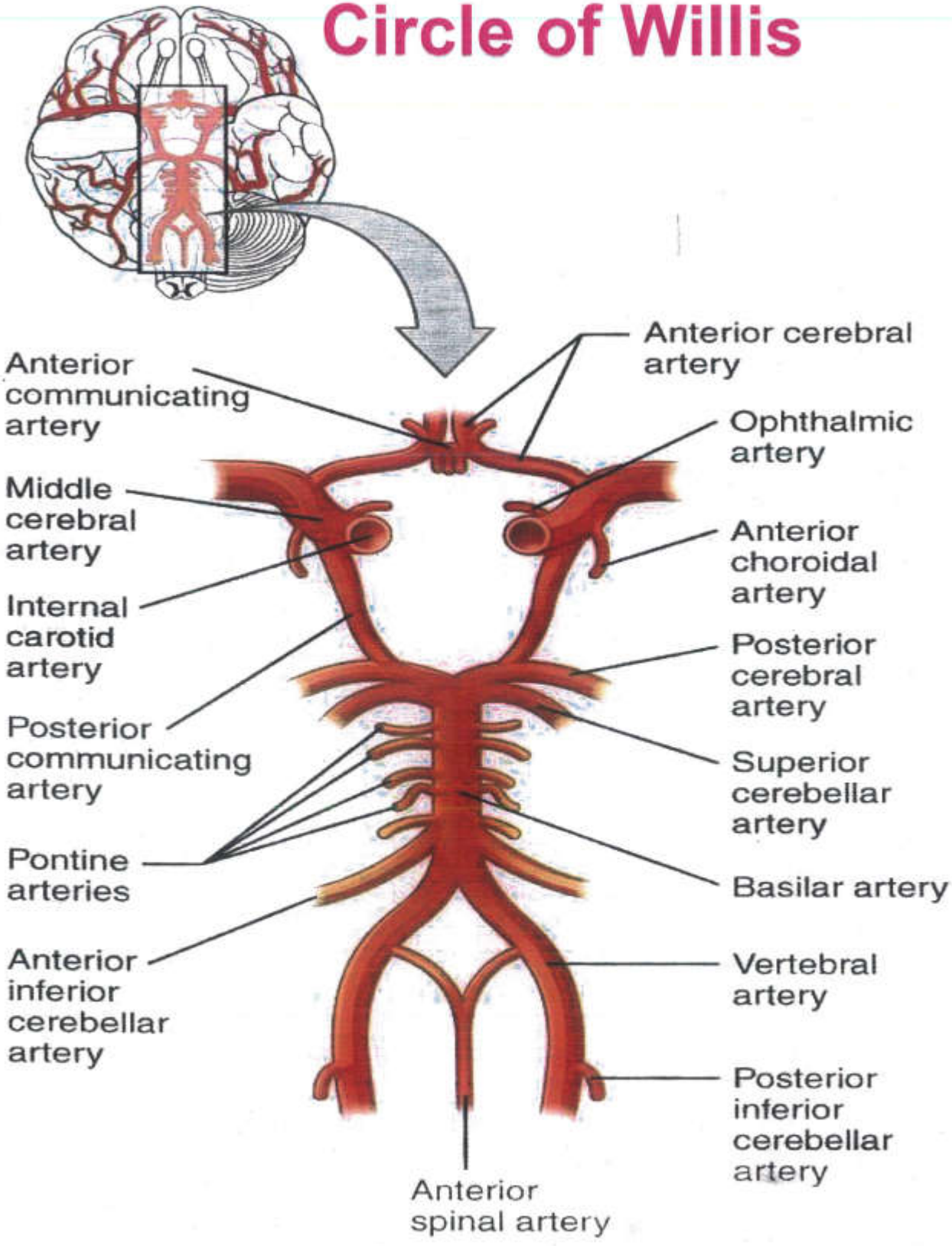
Internal Carotid Artery and its Branches

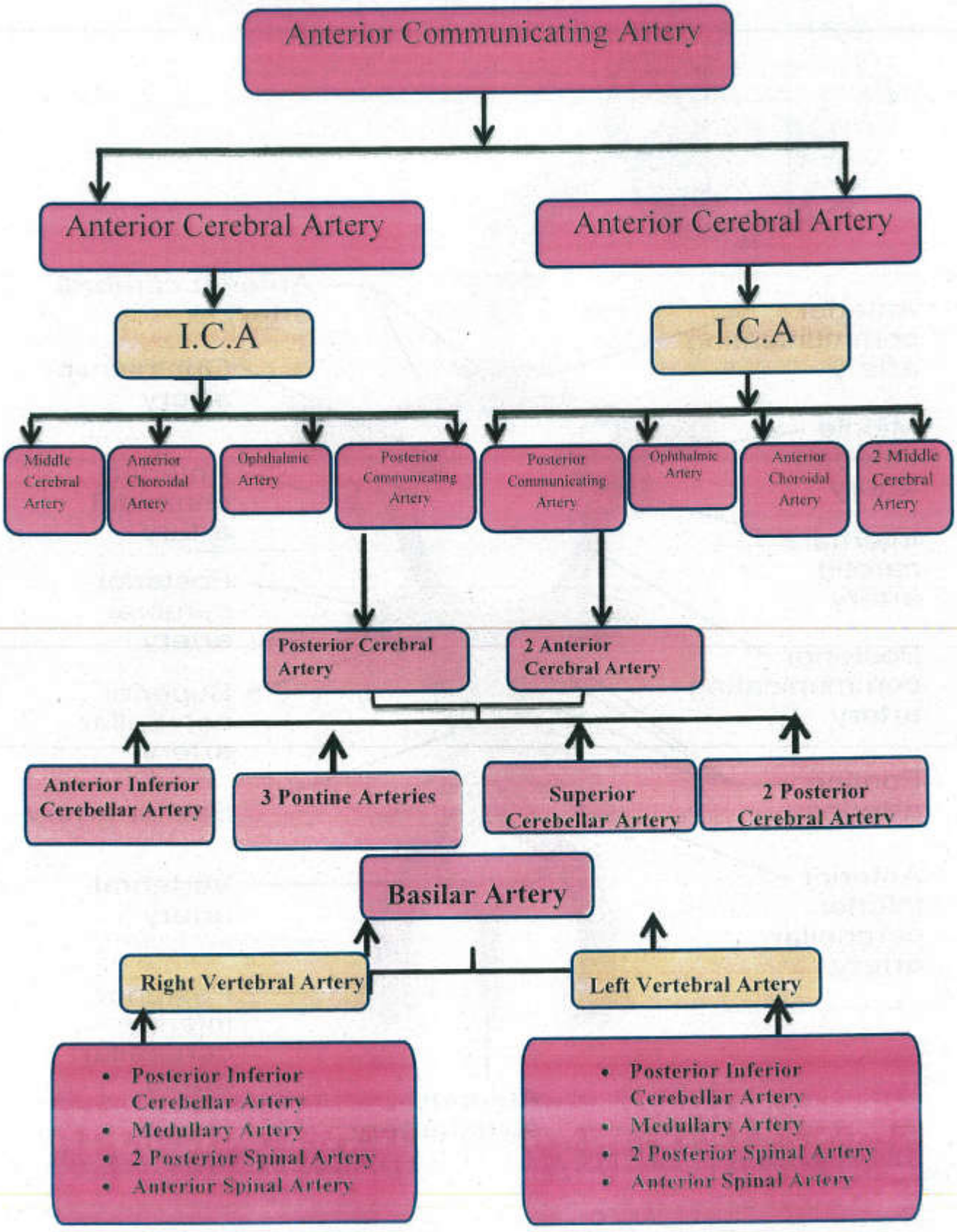


Veins of the Head and Neck

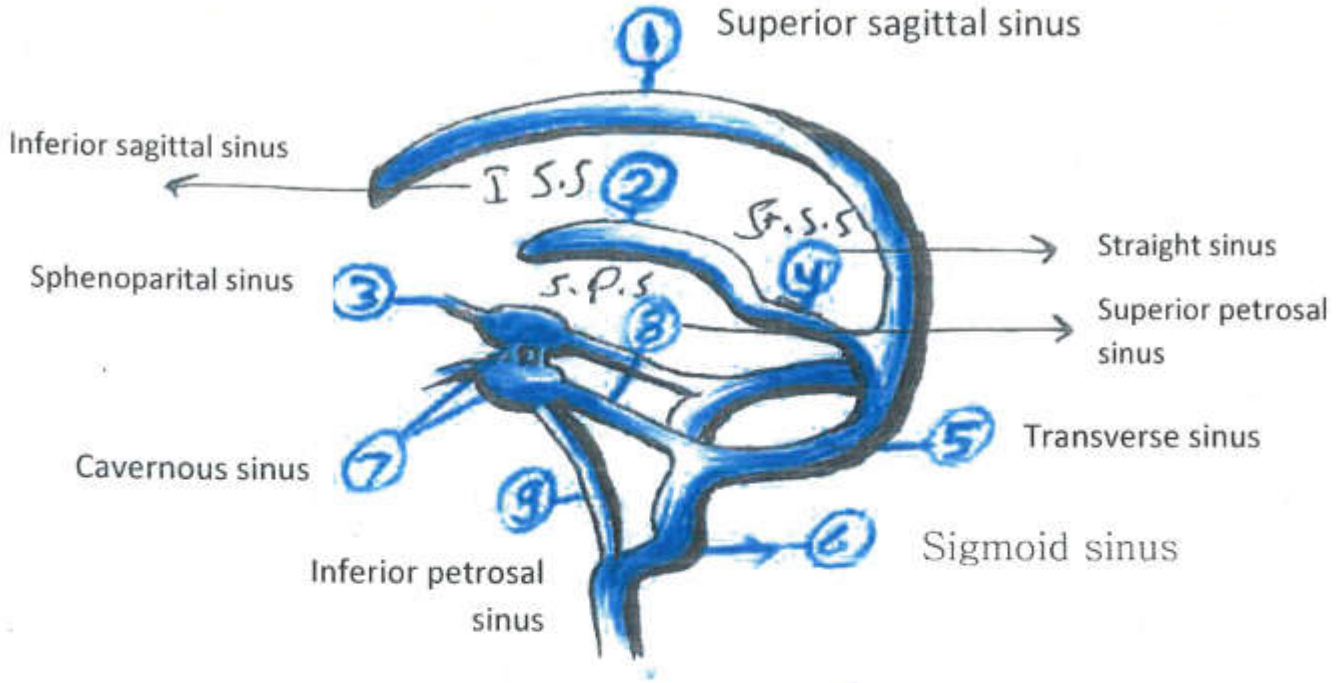


Circle of Willis




Anterior Communicating Artery
Anterior Cerebral Artery
Anterior Cerebral Artery
I.C.A
I.C.A
Middle Cerebral Artery
Anterior Choroidal Artery
Ophthalmic Artery
Posterior Communicating Artery
Posterior Communicating Artery
Ophthalmic Artery
Anterior Choroidal Artery
2 Middle Cerebral Artery
Posterior Cerebral Artery
2 Anterior Cerebral Artery
Anterior Inferior Cerebellar Artery
3 Pontine Arteries
Superior Cerebellar Artery
2 Posterior Cerebral Artery
Basilar Artery
Right Vertebral Artery
Left Vertebral Artery
Posterior Inferior Cerebellar Artery
Medullary Artery
2 Posterior Spinal Artery
Anterior Spinal Artery
Posterior Inferior Cerebellar Artery
Medullary Artery
2 Posterior Spinal Artery
Anterior Spinal Artery

TERMINATION OF DURAL SINUSES



1. Superior sagital sinus ends posteriorly in confluence of sinuses and continuous with RIGHT transvers sinus.

2. Inferior sagital sinus ends by joining with straight sinus.

3. Sphenoparital sinus drains into cavernous sinus.

4. Straight sinus ends in confluence of sinuses.

5. Transvers sinus end sigmoid sinuses.

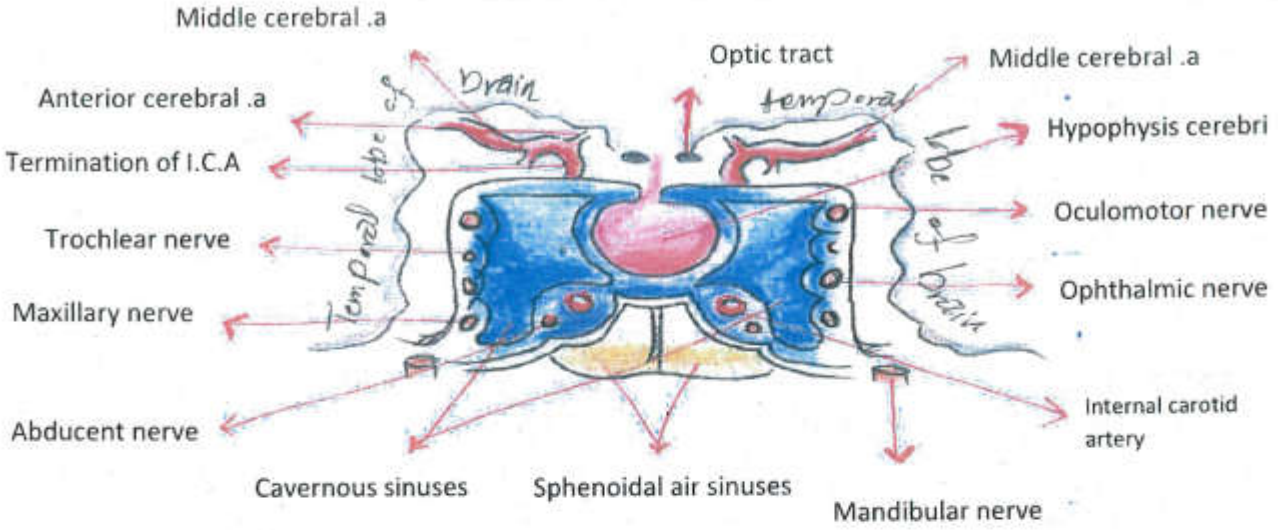
6. Sigmoid sinuses end into jugular bulb, which continue to internal jugular vein.

7. Cavernous sinuses right and left drain into (superior and inferior petrosal sinuses).

8. Superior petrosal sinuses connect cavernous sinuses with transvers sinus.

9. Inferior petrosal sinuses connect cavernous sinuses with the jugular vein.

CAVERNOUS SINUS



CONTENTS

* Medially

1. Internal Carotid artery.
2. The 6th cranial nerve (Abducent .n).

* Laterally

1. Oculomotor nerve. (Third cranial .n)
2. Trochlear nerve. (Fourth cranial .n)
3. Ophthalmic nerve. (First branch of 5th cranial .n (TRIGIMINAL))
4. Maxillary nerve. (Second branch of 5th cranial .n (TRIGIMINAL))

Note: - the content (structures that passing through the sinus) are separated from the venous blood by the endothelium lining of the sinus.

CAVERNOUS SINU:

Applied Anatomy

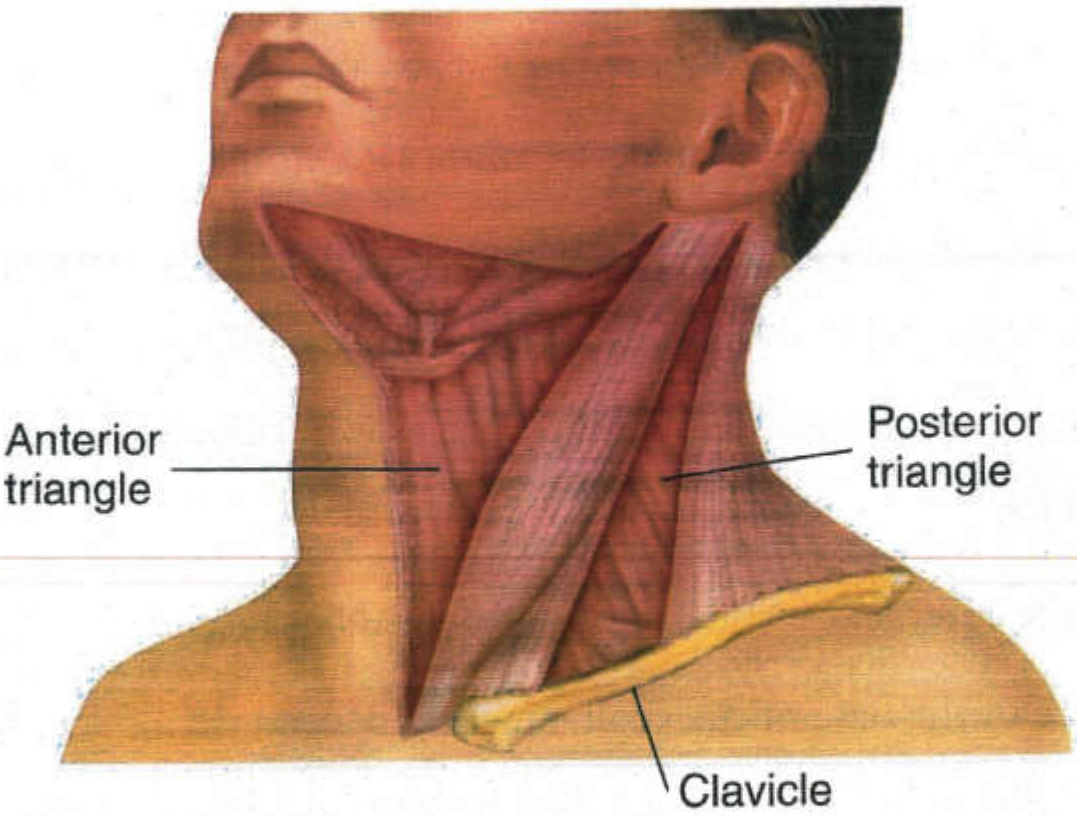
1_Septic THROMBOSIS of cavernous sinus maybe caused by numerous communications from the dangerous area of face, orbit and pharynx.

This manifested by severe pain in the eye and head along the distribution of ophthalmic nerve, OPHALAMOPLEGIA due to involvement of 3rd ,4th , and 6th cranial nerves, and marked edema of eye lid with exophthalmos due to be bilateral due to inter-communications between the cavernous sinuses of the two sides.

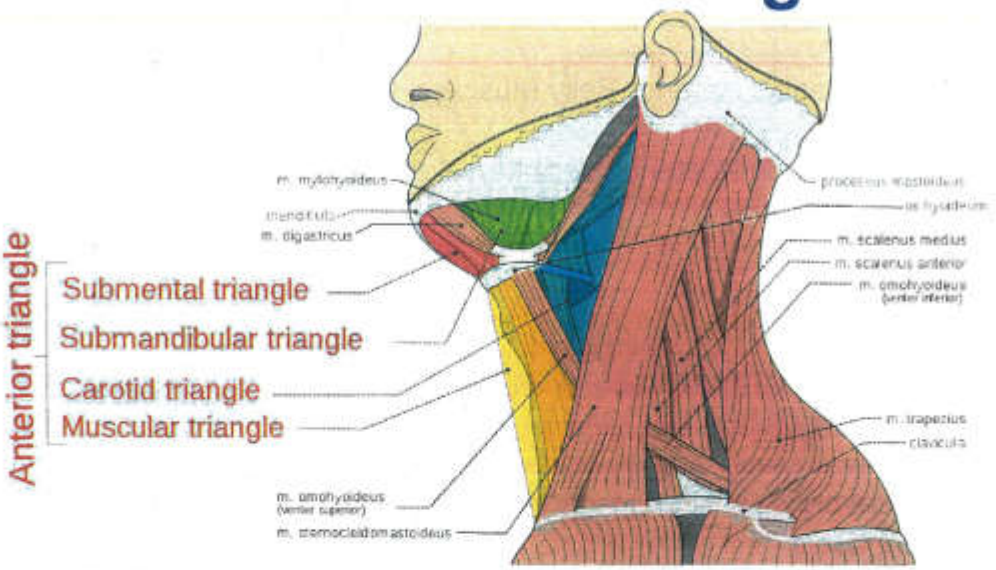
2_If the internal carotid artery is ruptured because of fracture of the base of the skull, an anterio-venous communication maybe established between the blood of the artery and cavernous sinus. It is manifested by pulsating exophthalmic, edema of eyelid, partial or complete ophthalmoplegia and a loud systolic murmur over the temporal region. Ligation of internal carotid artery may be helpful, but this may develop contra-lateral hemiplegia.

Triangles of the Neck

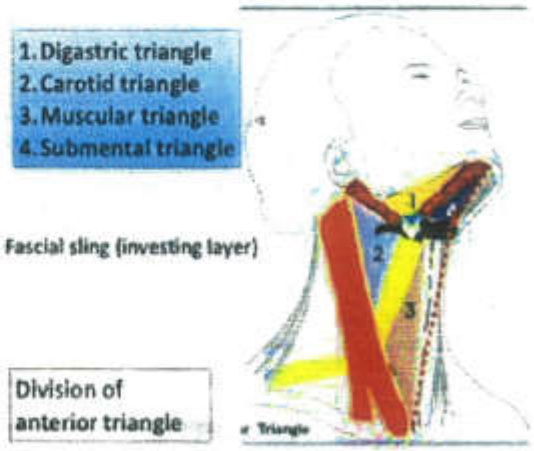
The neck is divided by the sternocleidomastoid muscle to an anterior and posterior triangle.



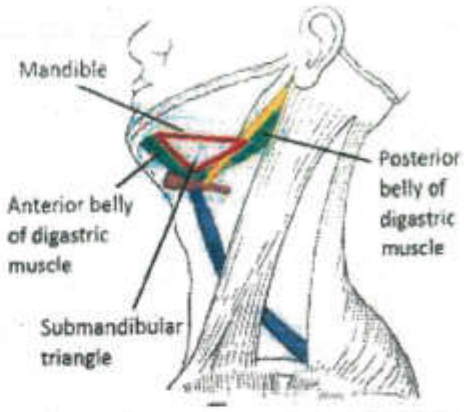
Anterior Triangle



- **Definition:** it is the triangular area of the neck found anteriorly to the sternocleidomastoid muscle.
- **Boundaries of the Anterior Triangle:**
  - Anteriorly:
    - Median line of neck
  - Posterioly:
    - Anterior border of sternomastoid
  - Superiorly:
    - Lower border of mandible
  - Base:
    - Manubrium Sterni
- **Anterior Triangle of the neck is subdivided into 4 parts:**
  1.) Digastric (Submandibular) △
  2.) Submental △
  3.) Muscular △
  4.) Carotid △

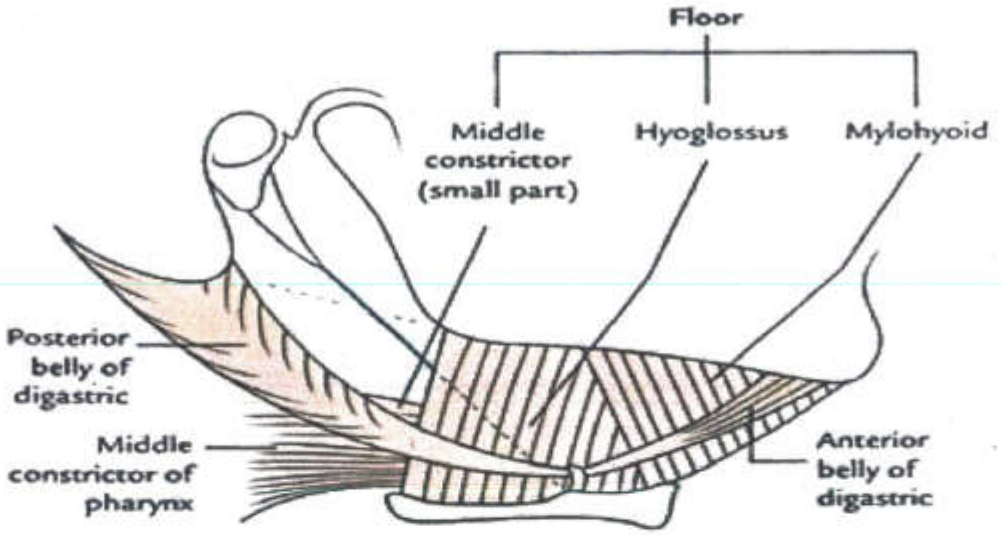


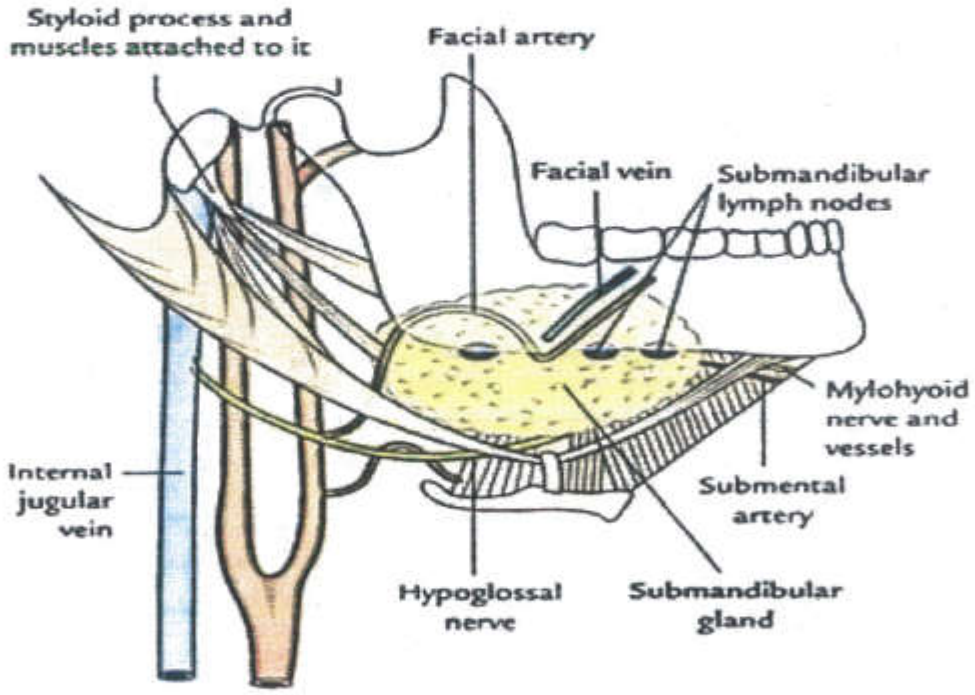
1.) Digastric (Submandibular) △



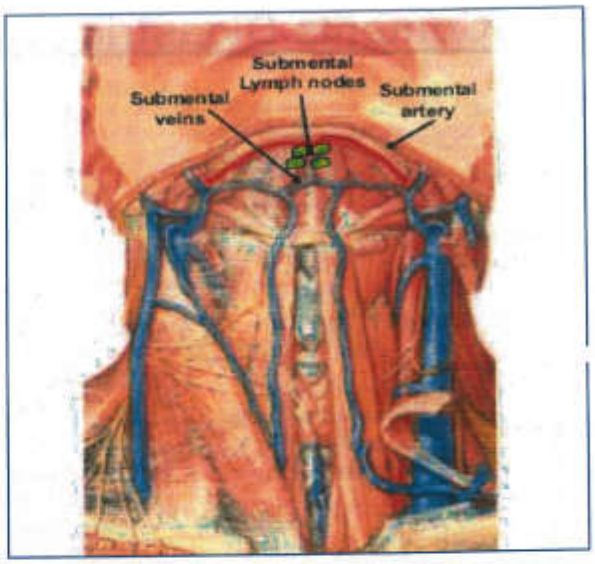
- **Boundaries:**
  - **Anteriorly:**
    - Digastric Anterior Belly Muscle
  - **Posteriorly:**
    - Digastric Posterior Belly Muscle
  - **Base:**
    - Mandible
  - **Apex:**
    - Intermediate Tendon
- **Roof:**
  - Skin
  - Superficial fascia and its content (platysma, anterior facial vein and cervical branch of cervical nerve
  - Deep fascia
- **Floor:**
  - **Anteriorly:**
    - The posterior part of Mylohyoid Muscle
  - **Posteriorly:**
    - The posterior part of Hyoglossus Muscle
- **Contents:**
  - **Structure:**
    - Submandibular Salivary Gland
    - Submandibular Lymph Nodes
  - **Vessels:**
    - Part of facial artery and its submental branch
    - Common facial vein
  - **Nerves:**
    - Hypoglossal nerve
    - Nerve to Mylohyoid muscle
    - Lingual nerve and submandibular ganglion.

Contents Digastric (Submandibular)





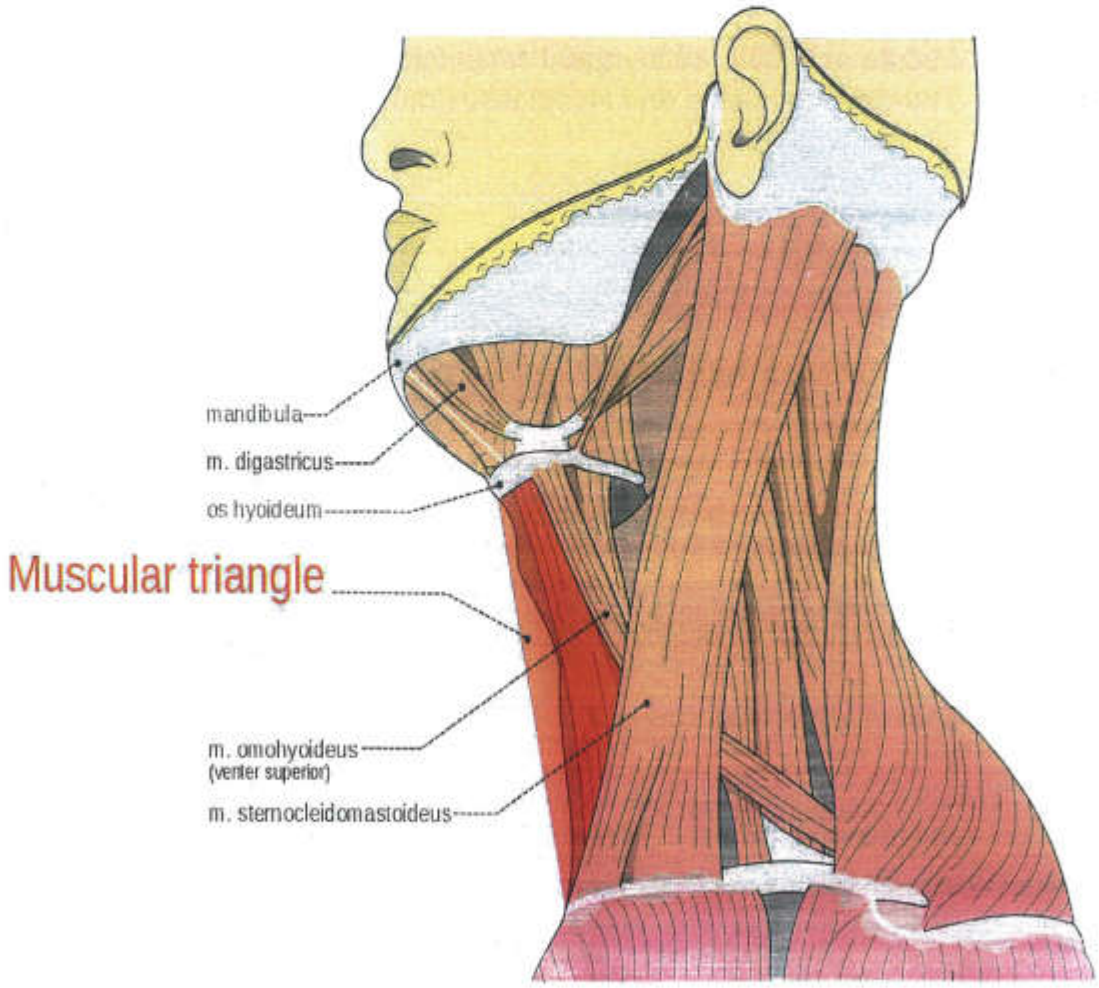
2.) Submental △



- **Boundaries:**
  - **Base:**
    - Hyoid bone
  - **Medially:**
    - Median line
  - **Laterally:**
    - Digastric Anterior Belly Muscles
  - **Apex:**
    - Chin
- **Contents:**
  - Lymph nodes only
- **Floor:**
  - Formed by the two Mylohyoid muscles with their Midian raphe

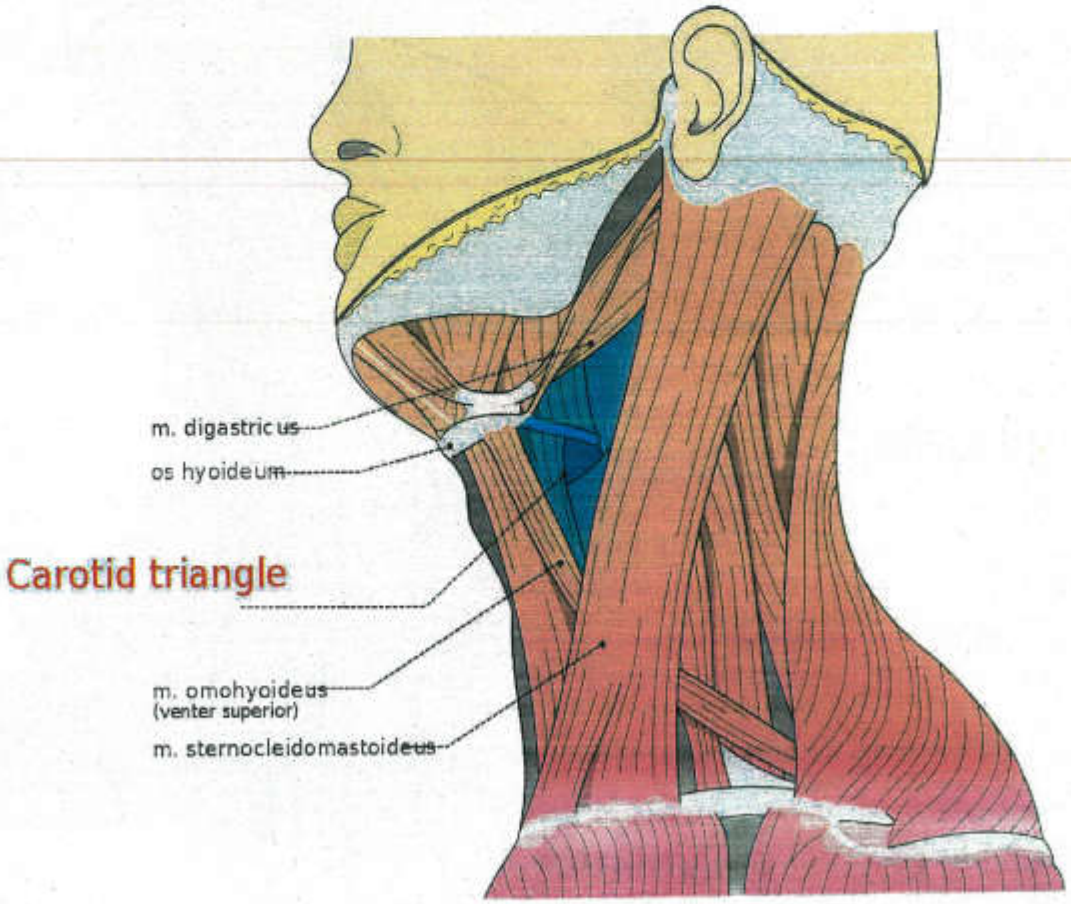
3.) Muscular △

- **Boundaries:**
  - Omohyoid Superior Belly Muscle
  - Anterior Border of Sternomastoid Muscle
  - Median Line of the front of the neck
- **Contents:**
  - Carotid Sheath
  - Vagus Nerve
  - Phrenic Nerve
- **Floor:**
  - Sternohoyid muscle
  - Strenothyroid muscle



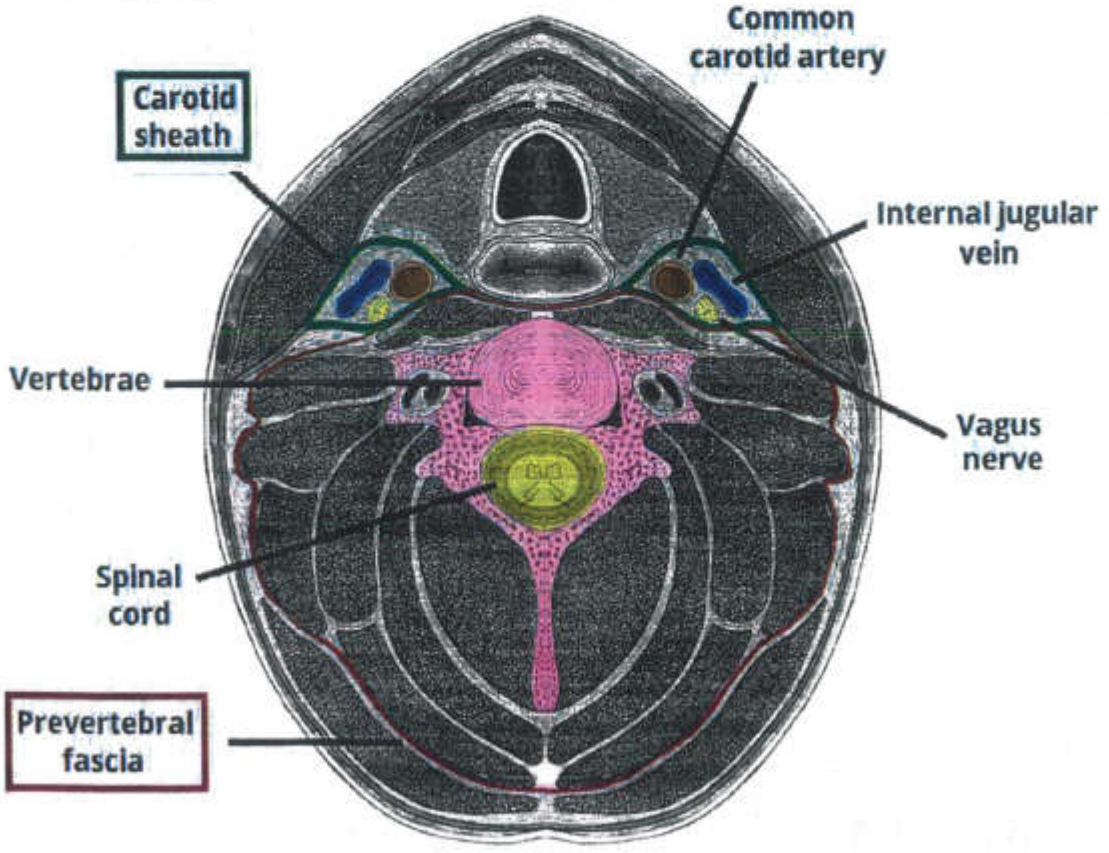
4.) Carotid △

- **Boundaries:**
  - Anterosuperiorly:
    - Digastric Posterior Belly Muscle
  - Anteroinferiorly:
    - Omohyoid Superior Belly Muscle
  - Posteriorly:
    - Anterior Border of Sternomastoid Muscle
- **Contents:**
  - Carotid sheath with its content.
  - Cervical sympathetic chain.
  - Deep cervical lymph node.
- **Floor:**
  - Middle and lower pharyngeal constrictors
  - Thyrohyoid muscle and Hyoglossus muscle



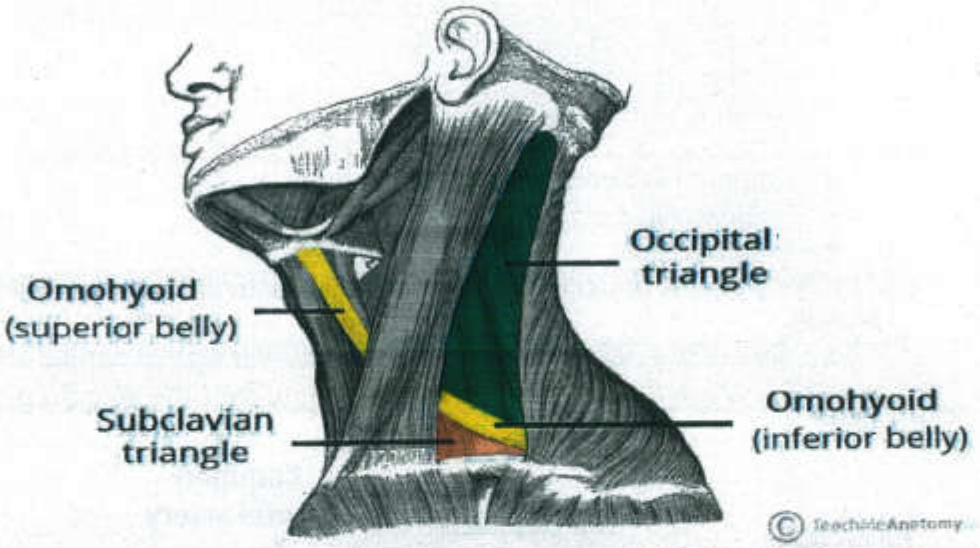
Carotid Sheath

- **Definition:** it's a tubular sheath of dense fibrous tissue that extends from the base of the skull above to the arch of the aorta below.
- **Content:**
  - In the Upper Part (above posterior Belly of Digastric Muscle)
    - Internal Carotid Artery (I.C.A.)
    - Internal Jugular Vein (I.J.V.)
    - Lower 4 Cranial Nerves 9-12
  - In the Lower Part (below posterior Belly of Digastric Muscle)
    - Common Carotid Artery (C.C.A.)
    - Internal Jugular Vein (I.J.V.)
    - Vagus Nerve
  - The sympathetic chain is embedded in the posterior wall of carotid sheath.
  - The 2 nerves of Ansa Cervicalis is in the anterior wall of carotid sheath.
- The Carotid Sheath is thick over the arteries but thin over the vein (to allow its distension)

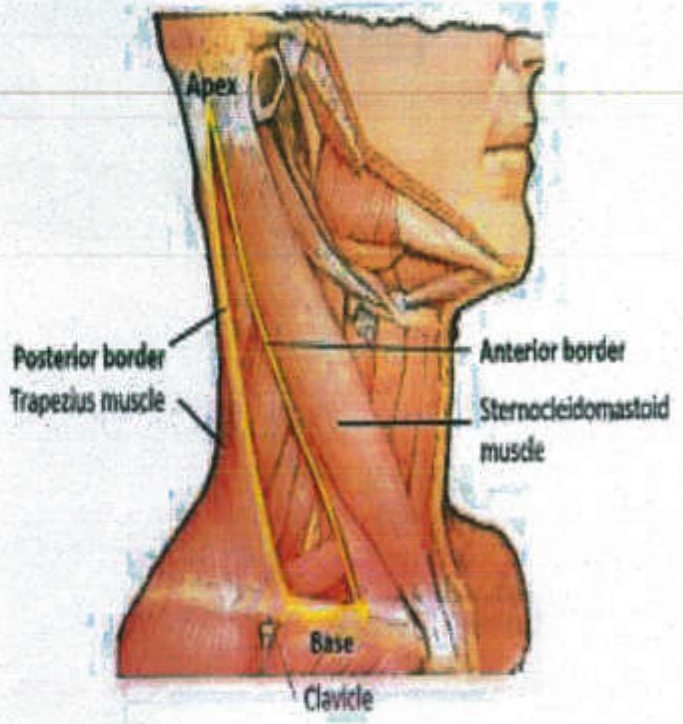


Posterior Triangular of the Neck:

- **Definition:** It's a muscular△(because it's almost entirely bounded by muscles).It is found in the posterior aspect of the neck.

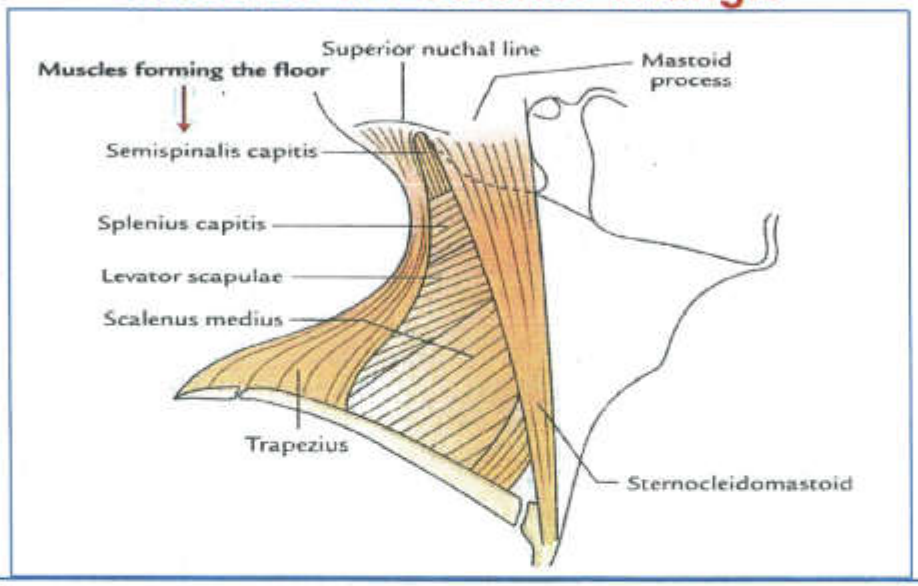


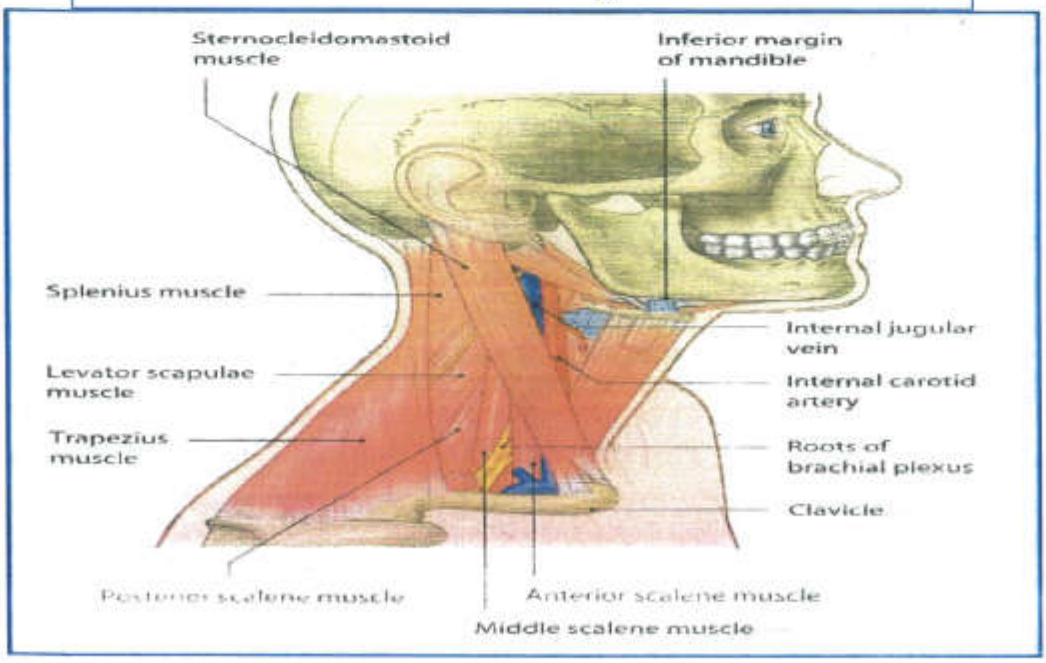
- **Boundaries:**
  - **Anterior Border:**
    - Formed by the posterior border of Sternocleidomastoid Muscle.
  - **Posterior Border:**
    - Formed by the anterior border of Trapezius Muscle.
  - **Base:**
    - Formed by the middle 1/3 of Clavicle.
  - **Apex:**
    - Formed by the meeting of the anterior border and posterior border.



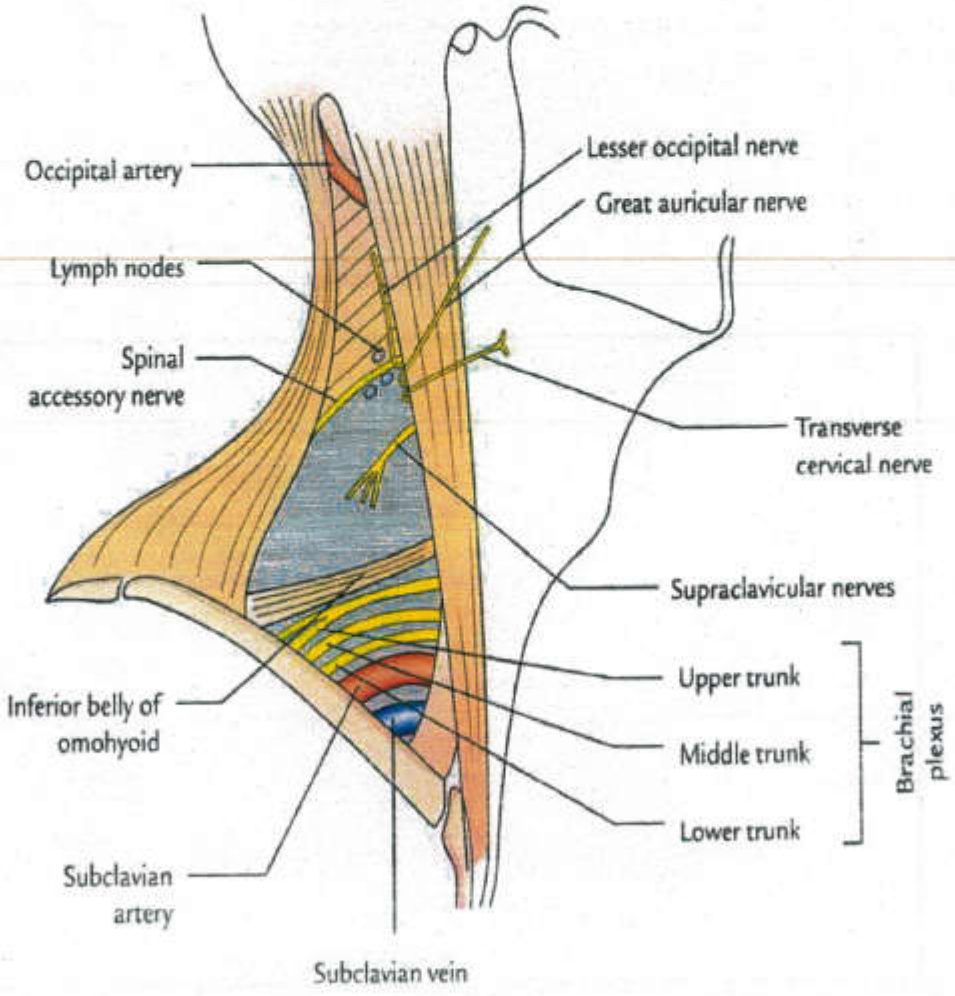
- **Roof:**
  - Formed by:
    1. Skin
    2. Superficial fascia with its content (cutaneous and subcutaneous tissue and superficial lymph node).
    3. Deep fascia with its content.
- **Floor:** Superiorly there are three muscles and 3 muscles inferiorly.

Muscles of Posterior Triangle

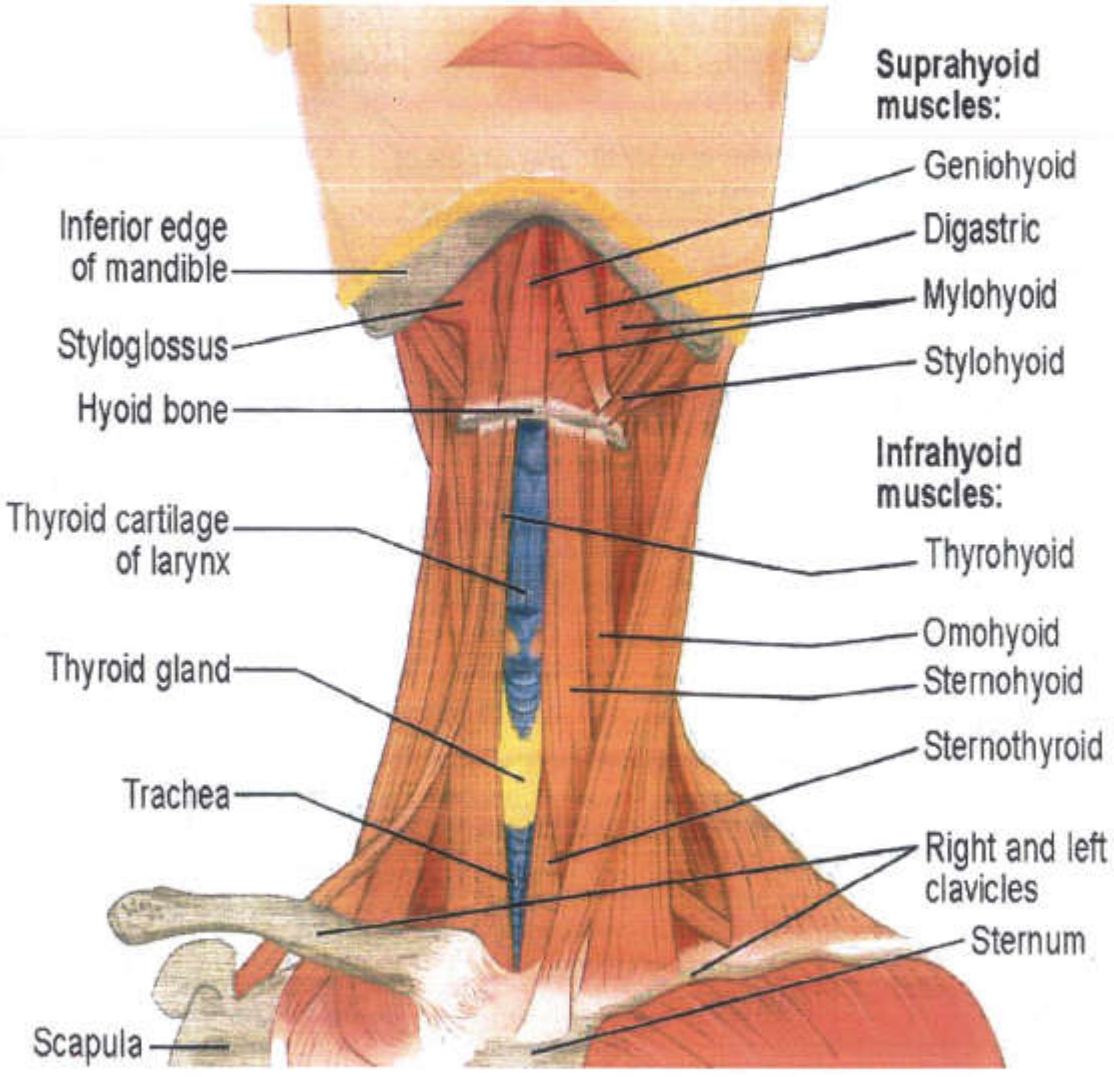




Content of the Occipital Triangle	Content of the Supraclavicular Triangle
1.) Occipital Vessels (Artery, nerve, and vein) 2.) Spinal Accessory Nerve 3.) Greater and Lesser Auricular Nerve 4.) Deep Cervical Lymph Node	1.) Third part of Subclavian Artery 2.) Subclavian Vein 3.) Terminal part of External Jugular Vein 4.) Trunks of Brachial Plexus: a. Upper Trunk b. Middle Trunk c. Lower Trunk

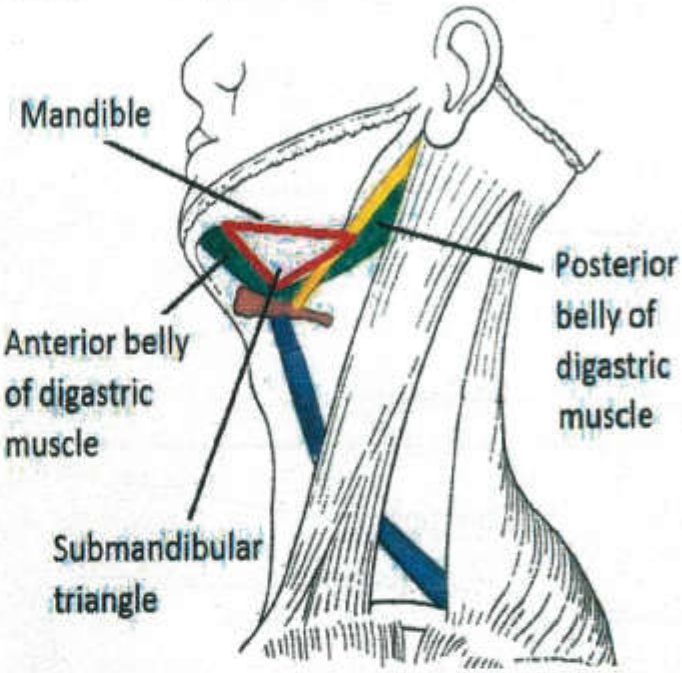


Muscles of the Neck	
Suprahyoid Muscles	**Infrahyoid Muscles**
1. Digastric Muscle	1. Sternohyoid Muscle
2. Stylohyoid Muscle	2. Sternothyroid Muscle
3. Geniohyoid Muscle	3. Thyrohyoid Muscle
4. Mylohyoid Muscle	4. Omohyoid Muscle

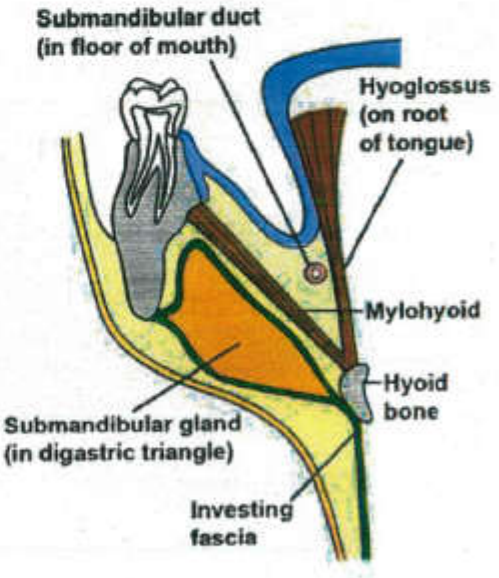


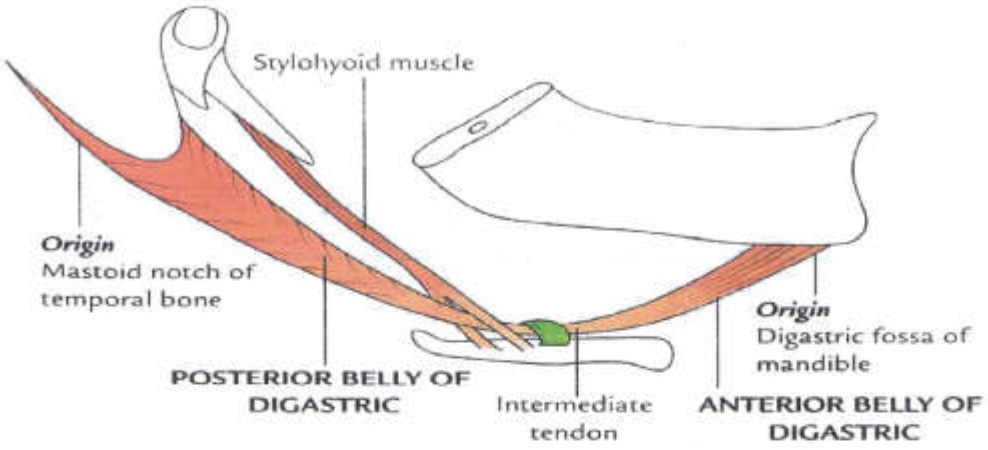
Digastric Triangle

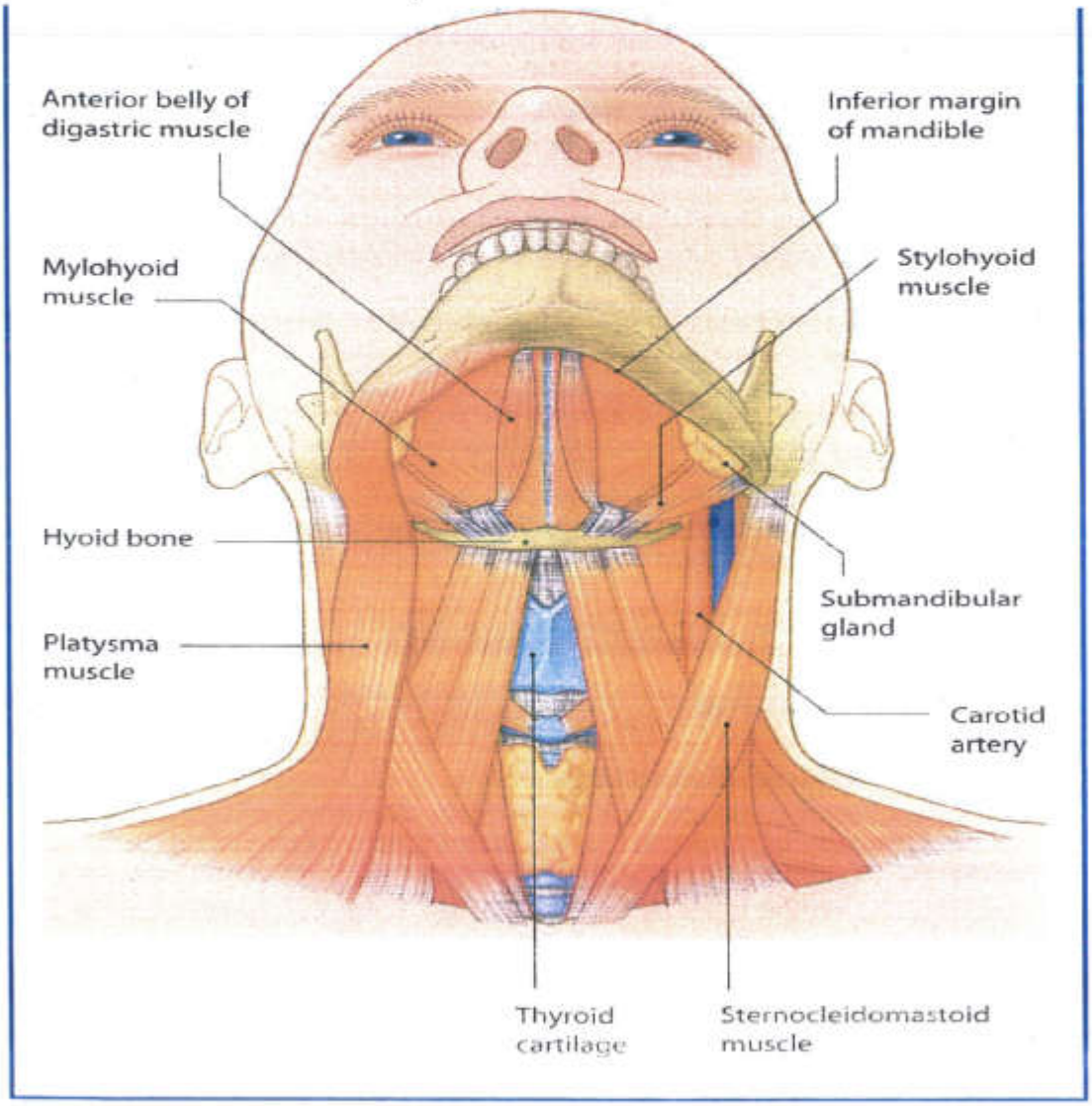
- **Definition:** it's a triangular area that lies below the body of the mandible and the imaginary line from the angle of the mandible to mastoid process.
- **Boundaries:**
  - **Anteriorly:**
    - Anterior Belly of Digastric
  - **Posteriorly:**
    - Posterior Belly of Digastric and Stylohyoid
  - Superiorly:
    - Lower border of body of mandible and mastoid process.



- **Floor:**
  - **Anteriorly:**
    - Mylohyoid Muscle
  - **Posteriorly:**
    - Part of Hyoglossus
- **Contents:**
  - **Anterior Part:**
    1.) Glands:
      a. Submandibular Gland and Submandibular Lymph Nodes.
    2.) Facial Artery:
      a. Deep to gland
    3.) Facial Vein:
      a. Superficial to the gland
    4.) Submental Artery
      a. Superficial to the Mylohyoid
    5.) Hypoglossal Nerve:
      a. Under Mylohyoid Muscle
    6.) Nerve and Vessels to Mylohyoid
      a. Superficial to Mylohyoid Muscle
  - **Posterior Part:**
    1.) Carotid Sheath and its content
    2.) Parotid gland (Lower part




Stylohyoid muscle
Origin
Mastoid notch of temporal bone
POSTERIOR BELLY OF DIGASTRIC
Intermediate tendon
Origin
Digastric fossa of mandible
ANTERIOR BELLY OF DIGASTRIC


Anterior belly of digastric muscle
Inferior margin of mandible
Mylohyoid muscle
Stylohyoid muscle
Hyoid bone
Submandibular gland
Platysma muscle
Carotid artery
Thyroid cartilage
Sternocleidomastoid muscle

- **Digastric Muscle:**
  - It has an anterior and a posterior belly.
    - **Posterior Belly:**
      - **Attachments:**
        - Mastoid Process
        - Intermediate Tendon in Hyoid Bone
      - **Nerve Supply:**
        - Facial Nerve
    - **Anterior Belly:**
      - **Attachments:**
        - Lower border of the body of mandible
        - Intermediate Tendon in the Hyoid Bone
      - **Nerve Supply:**
        - Nerve to Mylohyoid Muscle.
  - **Action of Digastric Muscle:**
    - Depression of the mandible
    - Elevation of the Hyoid Bone.
- **Note:**
  - The Digastric Muscle is known as the key muscle of the neck because it covers important structures, specifically 3 important nerves and 3 important vessels.
  - The Digastric Fossa is found in the aspect of the anterior inner/internal mandible.

- **Stylohyoid Muscle**
  - **Arises from:**
    - Styloid Process, it runs along the upper border of the Posterior Belly of Digastric
  - **Insertion:**
    - Hyoid Bone (between body and greater horn).
  - **Nerve Supply:**
    - Facial Nerve
  - **Action:**
    - Elevation of Hyoid Bone

Cranial Sutures and Fontanelles

Sutures

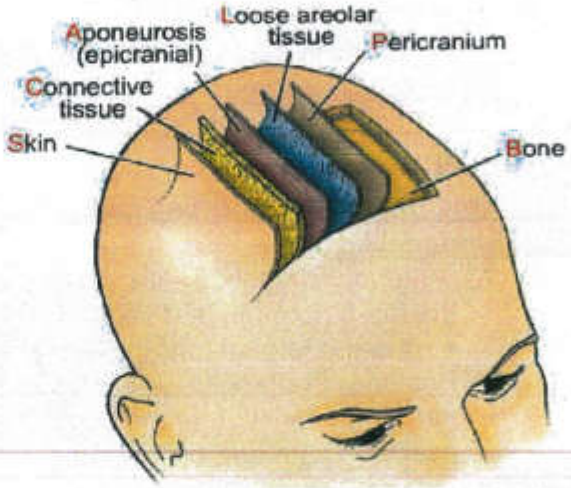
- **Definition:** They are the immobile joints found between the individual bones.
- **Types:**
  - **Frontal Suture:**
    - It divides the frontal bone into two halves in kids; this suture ossifies at the age of 2 years.
  - **Coronal Suture:**
    - It runs transversely between the frontal bone and the 2 parietal bones.
  - **Sagittal Suture:**
    - It runs in the median plane, connecting the 2 parietal bones.
  - **Lambdoid Suture:**
    - It runs between the occipital bone and the 2 parietal bones.

Fontanelles

- **Definition:** they are the meeting point of the sutures.
- **Main Fontanelles:**
  1.) Anterior Fontanelle—it's diamond shaped situated at the junction of the front, coronal, and sagittal sutures.
    - It is the largest fontanelle that fully ossifies at 18 months of age.
  2.) Posterior Fontanelle—it's a small triangular shaped membranous part at the junction of the sagittal and lambdoid sutures that usually ossifies at the age of 6 months.
- **Function of the Fontanelles:**
  - They help facilitate the delivery of the newborn
  - They allow growth of the skull bones and the enclosed brain.
  - They allow injections to be given and samples of CSP to be taken from newborns.
  - Help in diagnosis of certain diseases such as rickets, hydrocephalus, and dehydration.

Scalp

- It includes the soft tissues covering the scalp cap. this tissue is arranged into 5 layers:
  - **S:** skin
  - **C:** Connective Tissue (superficial fascia)
  - **A:** Aponeurosis of occipitofrontalis Muscle
  - **L:** Loose Areolar Connective Tissue
  - **P:** Pericranium



- **Main Blood Supply of Scalp :**
  - External Common Carotid
- **Arterial Supply to scalp:**
  1.) Supratrochlear Artery
  2.) Supraorbital Artery
  } **Internal Carotid Artery by Ophthalmic**

  3.) Superficial Temporal Artery
  4.) Posterior Auricular Artery
  5.) Occipital Artery
  } External Carotid Artery

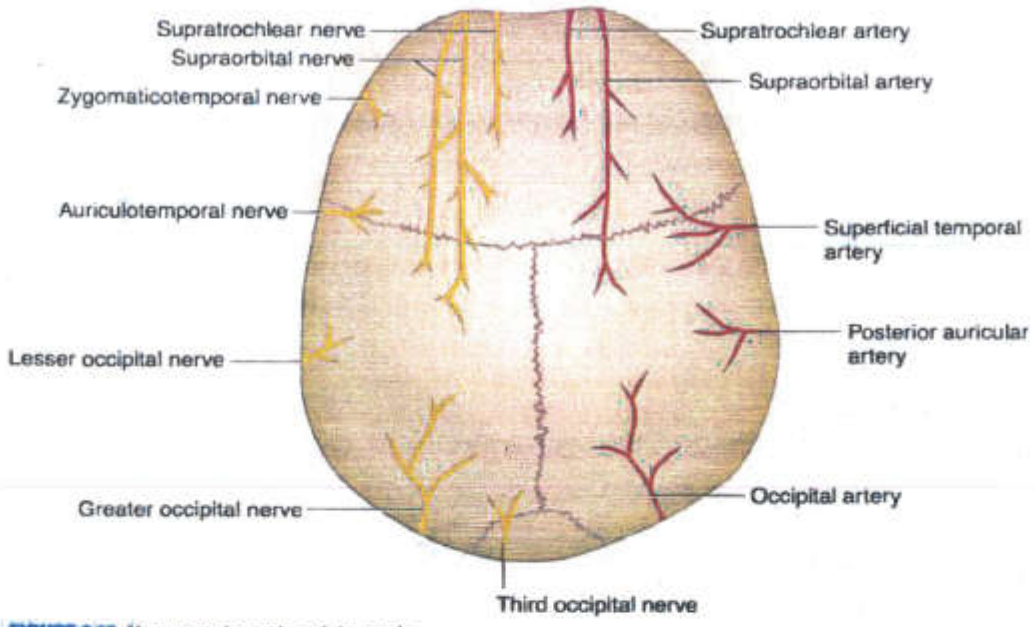
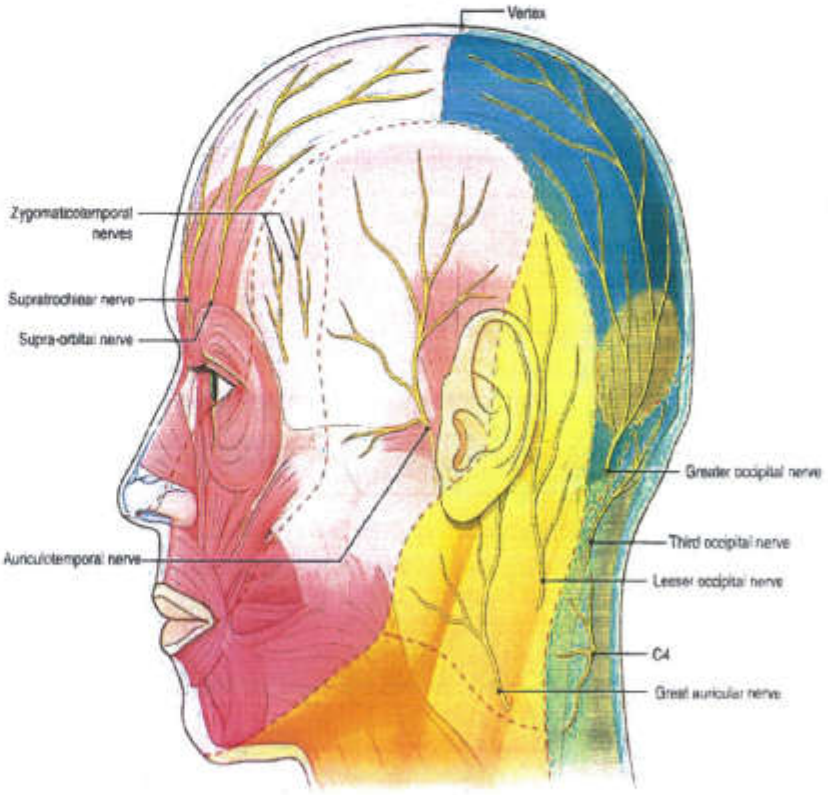


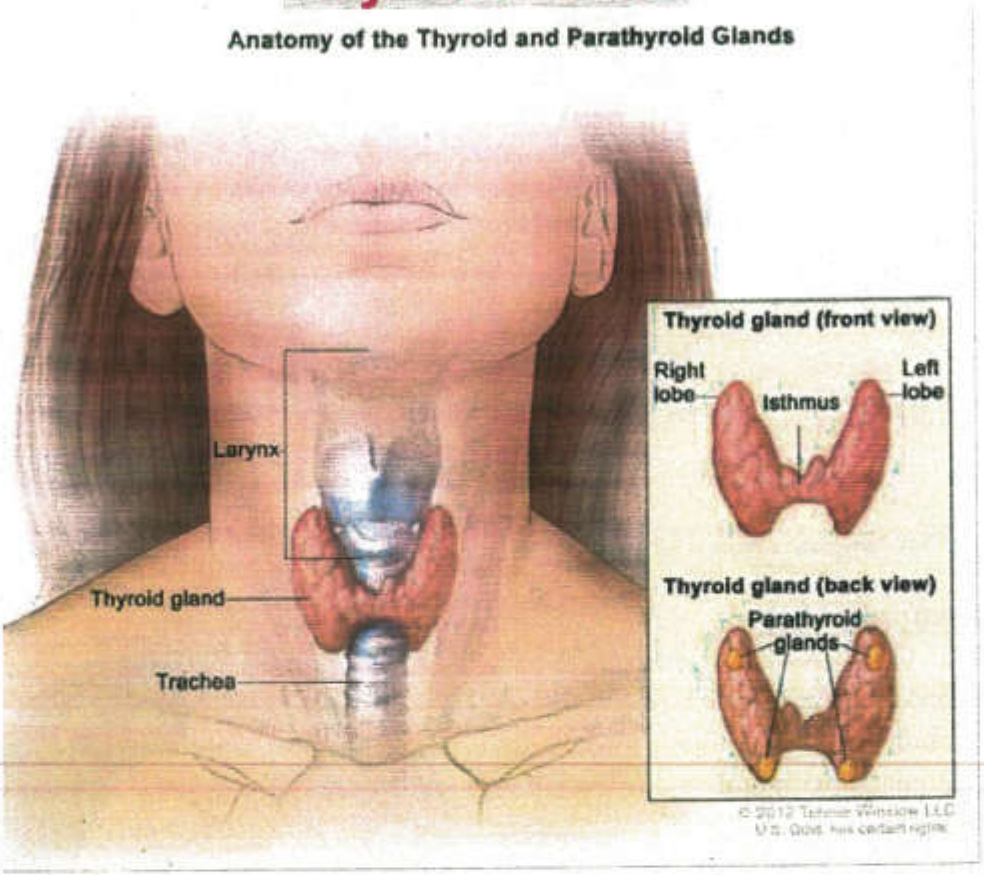
FIGURE 8.16. Nerves and arteries of the scalp.

Nerve supply of the scalp:

1.) Supratrochlear Nerve
2.) Supraorbital Nerve
3.) Zygomaticotemporal Nerve
4.) Auriculotemperal Nerve
5.) Temporal branch of Facial Nerve
6.) Grater Auricular Nerve
7.) Grater Occipital Nerve
8.) Lesser Occipital Nerve
9.) Third Occipital Nerve
10.) Posterior Articular Nerve



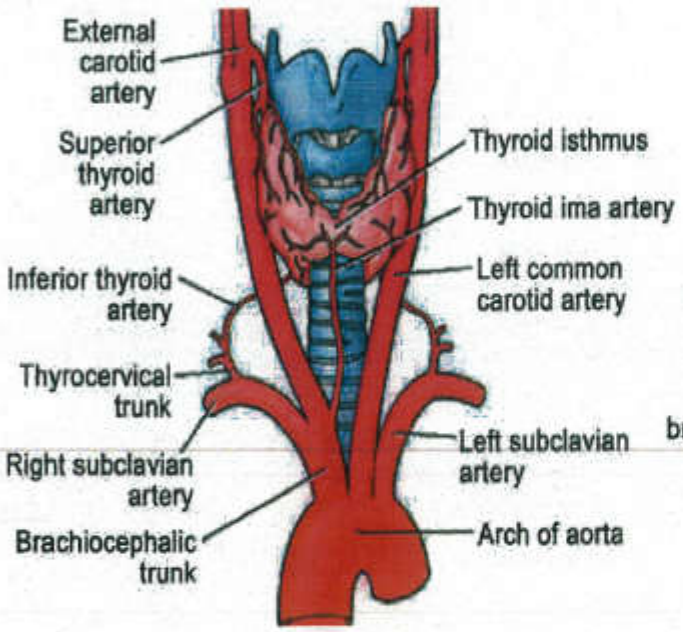
Thyroid Gland

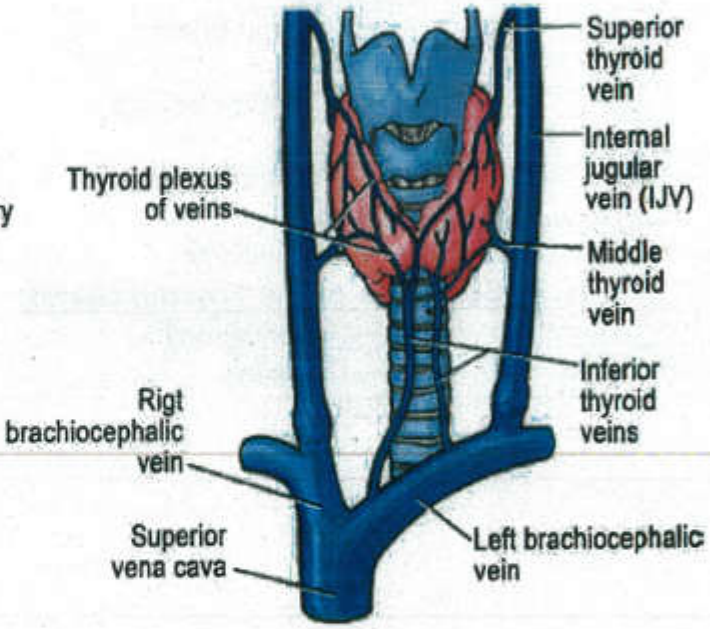


- **Definition:** it's the largest endocrine gland which lies in the front and side of the neck.
- **Weight:** it weights about 25 grams.
- **Shape:** it's H-shaped/ Butterfly, because it's formed by 2 lobes connected together at the center.
- **Structure:**
  - It's formed of the following parts:
    - Two lateral tops, each top is pear shaped.
    - Narrow median, isthmus, connecting the 2 lobes.
    - Small pyramidal lobe may project upward from the isthmus.

- **Relations:**
  - **Anteriorly:**
    - Skin
    - Superficial fascia
    - Deep Fascia
    - Sternothyroid and Sternohyoid muscles
  - **Posteriorly:**
    - Parathyroid glands
    - Larynx
    - Esophagus
  - **Laterally:**
    - Carotid Sheath
  - **Medially:**
    - Thyroid Cartilage
  - **Inferiorly:**
    - Cricoid Cartilage
  - Superiorly:
    - Hyoid Bone
- **Secretion of the Thyroid Gland:**
  - T3—Triiodothyronine
  - T4—Thyroxine
  - Calcitonin

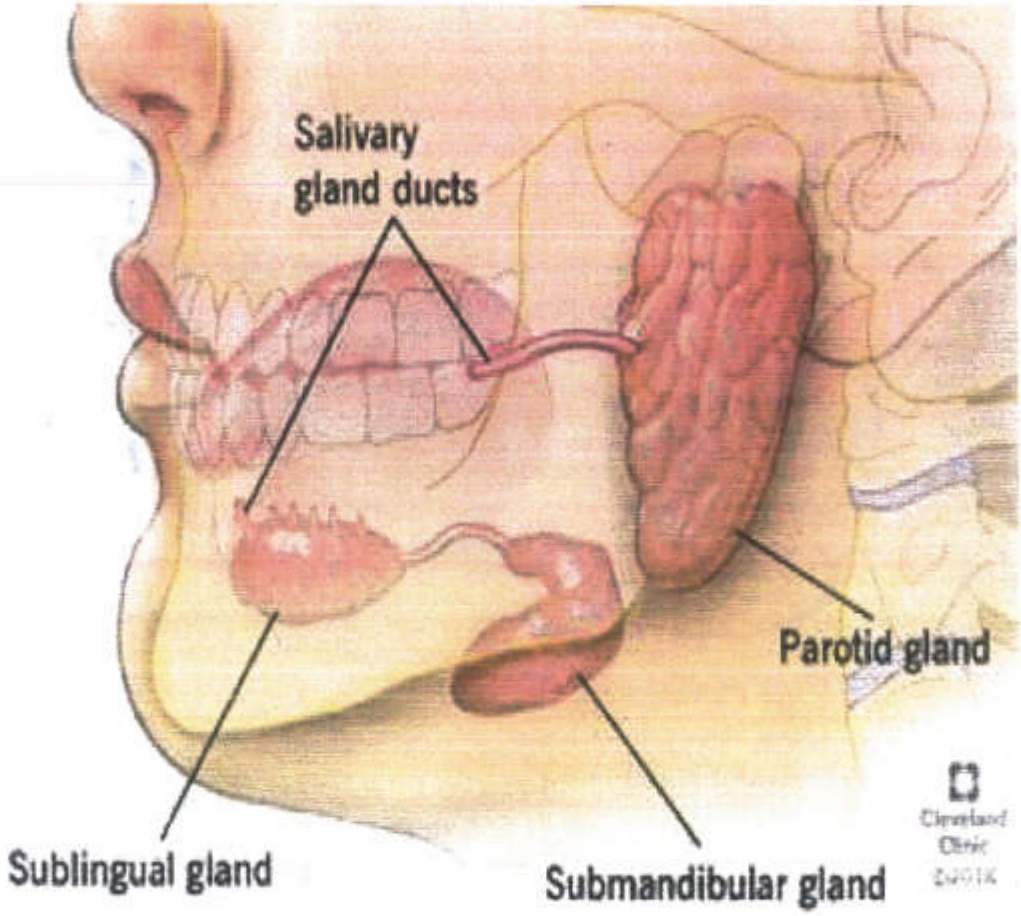
- **Blood Supply:**
  - Superior Thyroid Artery
  - Inferior Thyroid Artery
  - Thyroideamia Artery
- **Venous Drainage:**
  - Superior Thyroid Vein
  - Middle Thyroid Vein
  - Inferior Thyroid Vein





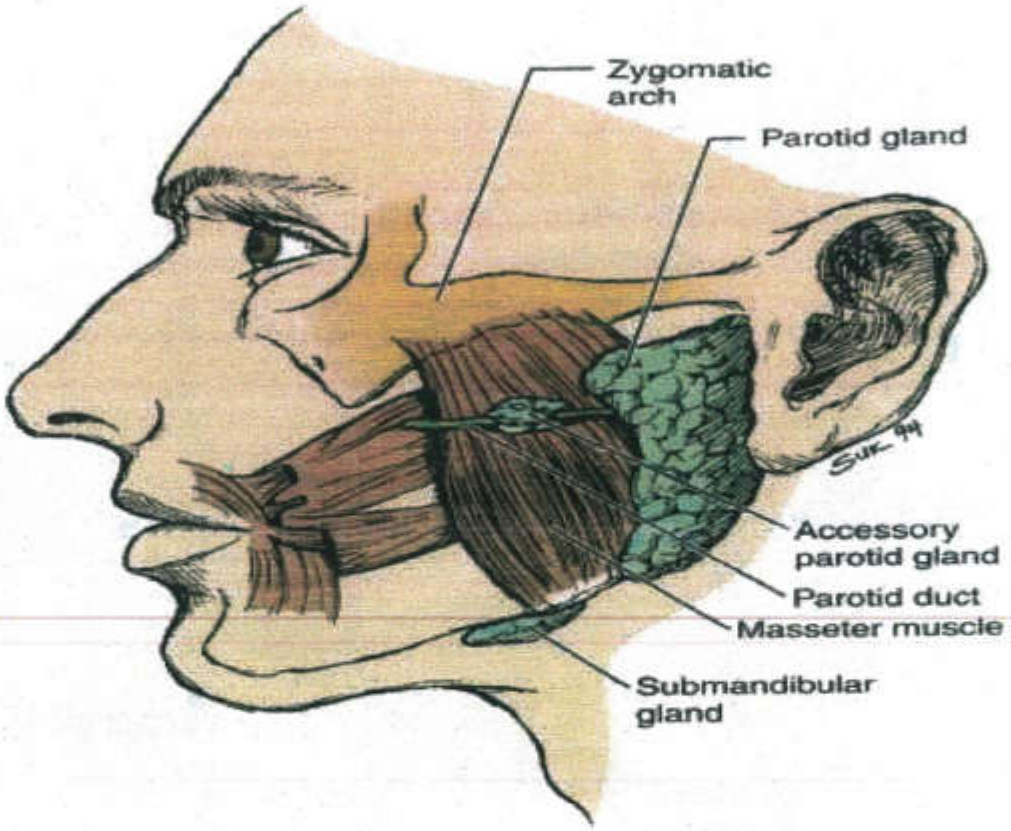
Salivary Glands

- **Types of Salivary Glands:**
  1.) Parotid gland
  2.) Submandibular gland
  3.) Sublingual gland

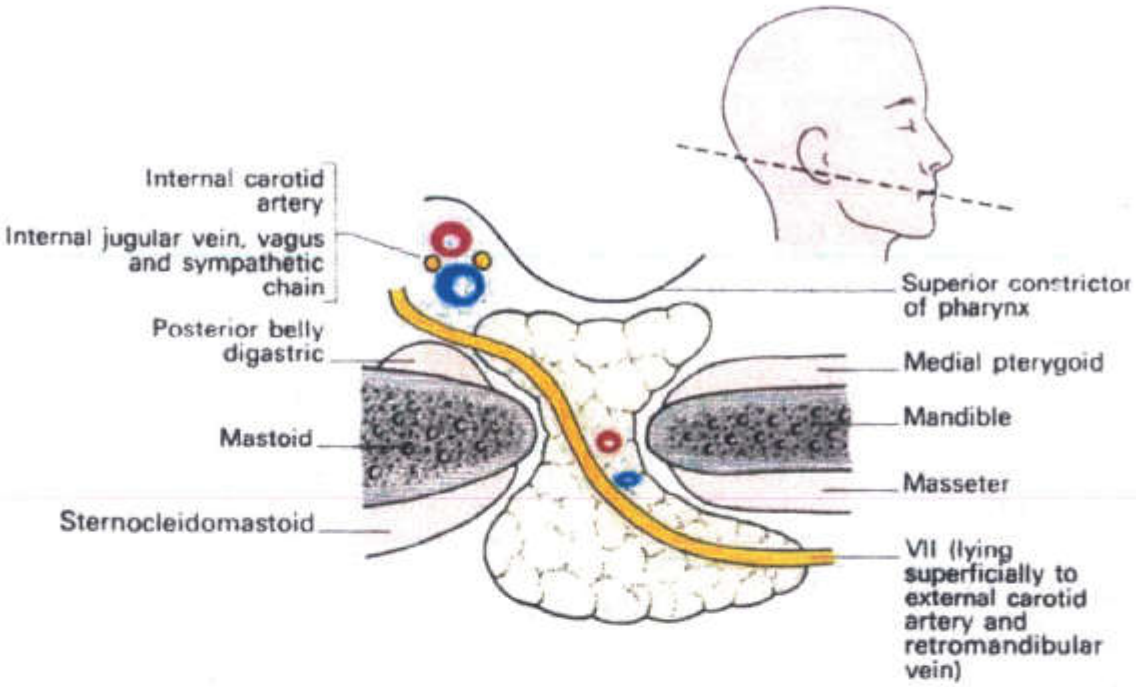


1.) Parotid Gland:

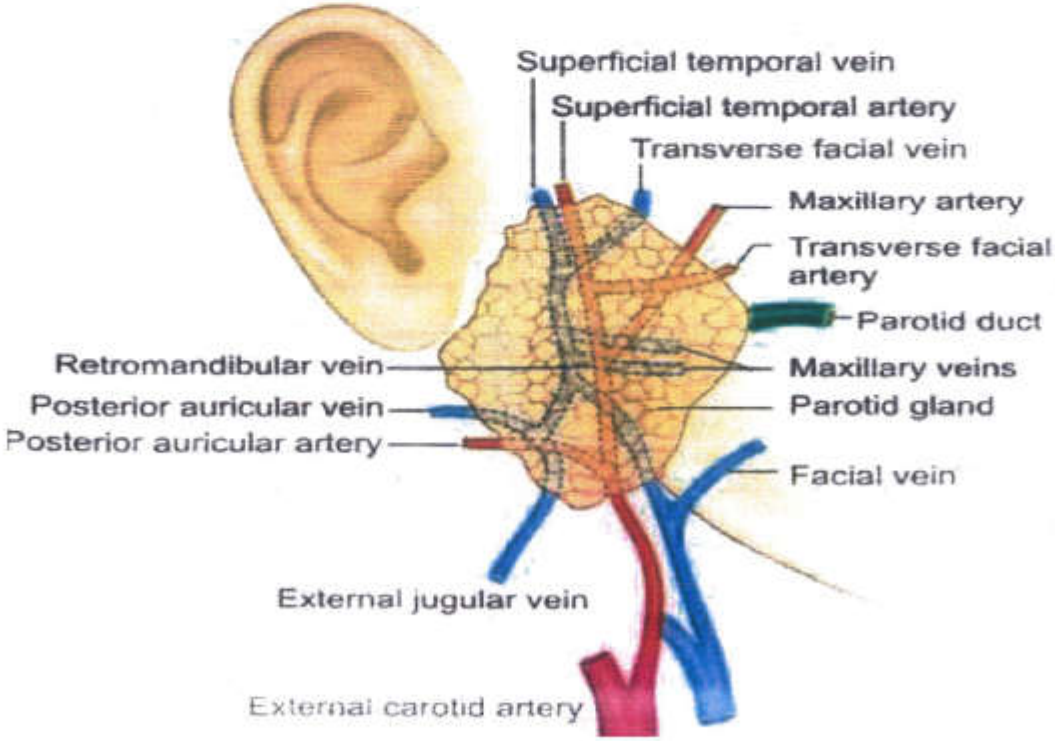
- **Definition:** It is the largest salivary gland, located in the lateral aspect of the face. It extends from zygomatic arch to the angle of mandible.
- **Shape:** pyramid – like shape.
- **Type:** serous gland.



- **Relation of parotid gland:**
  - **External Relations:** from the external surface of gland
    1- Skin
    2- Superficial fascia
    3- Deep fascia
    (it is tight)
  - **Internal Relations:** within the gland
    1. Facial nerve with its branches
    2. External Carotid Artery
    3. Retromandibular vein and its tributaries
    4. Sympathetic nerve plexus
    5. Lymph node



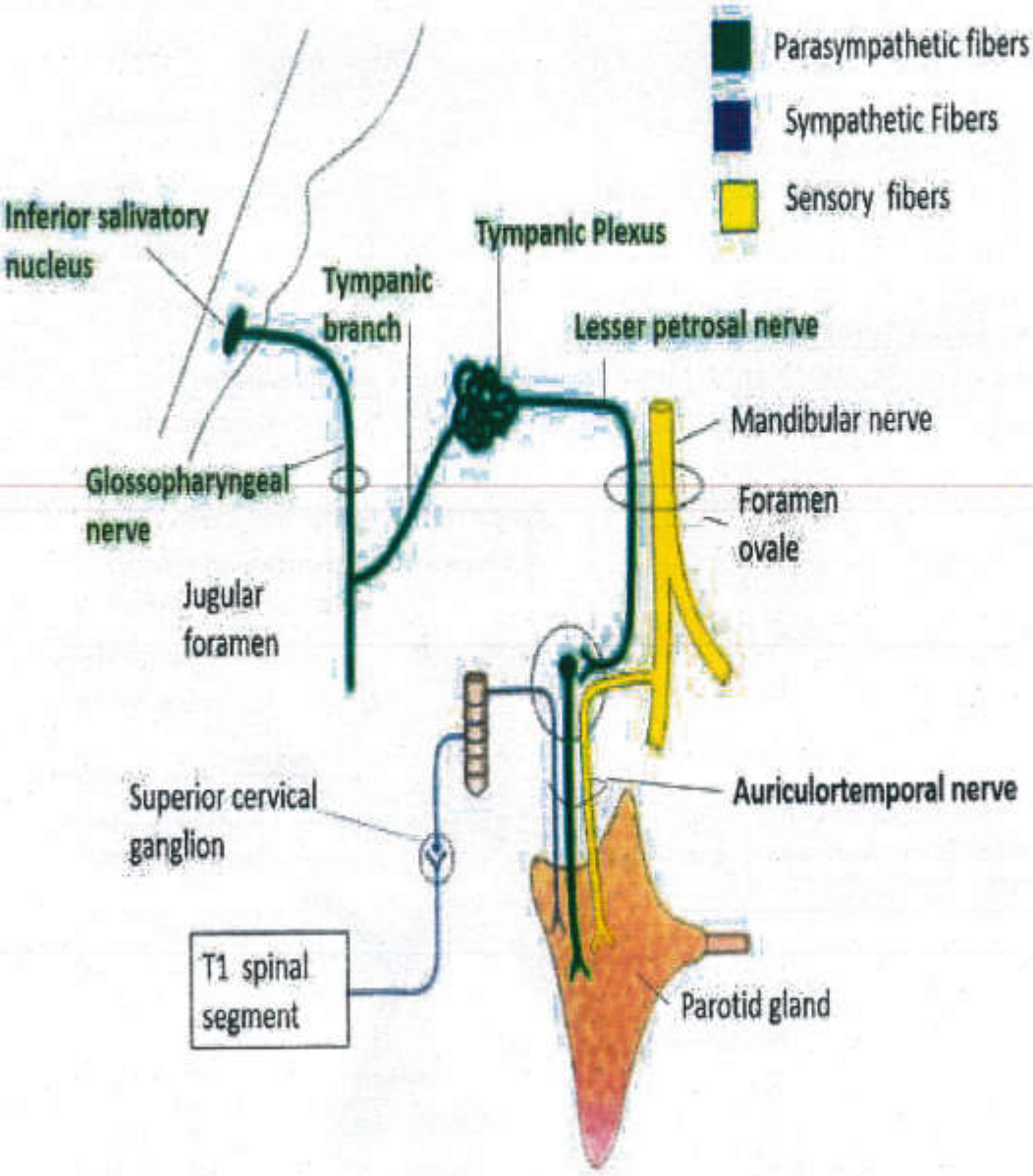
- **Blood Supply of Parotid Gland:**
  - **Arterial Supply:** it is external carotid artery with its branches.
  - **Venous Drainage:** retromandibular vein ⟶ external jugular vein



- **Nerve Supply:**
  - Sympathetic Nerve (from sympathetic plexus)
  - Parasympathetic Nerve(secremotor) from medulla
  - Sensory Nerve from gland

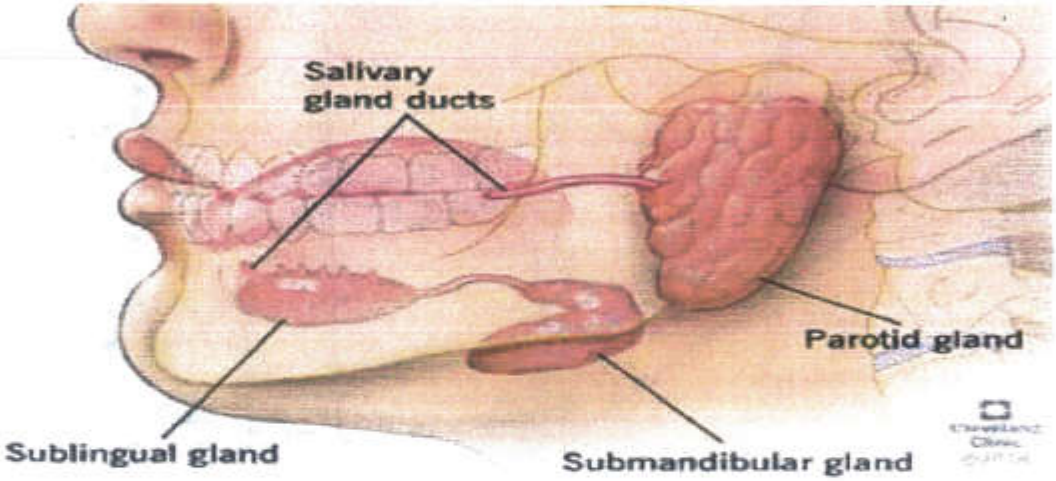
They reach the Parotid Gland through Auriculotemporal Nerve.

- **Secremotor (or parasympathetic) Nerve Supply:**
  - Parasympathetic nerve has 2 divisions (S.S.N&I.S. N)
  - The (I.S.N) is the one responsible for parasympathetic action

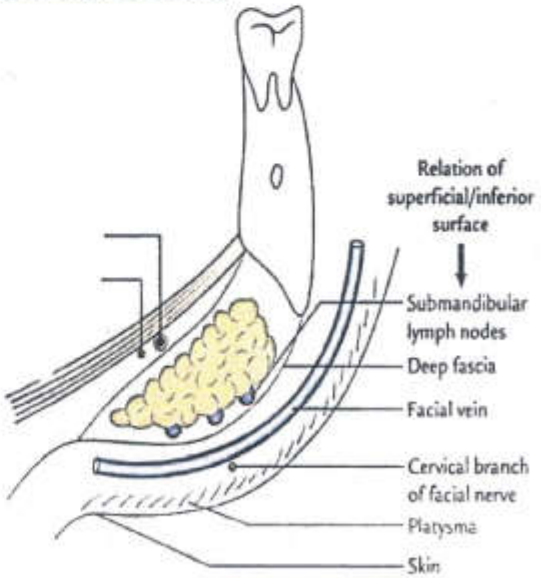


2.) Submandibular Salivary Gland:

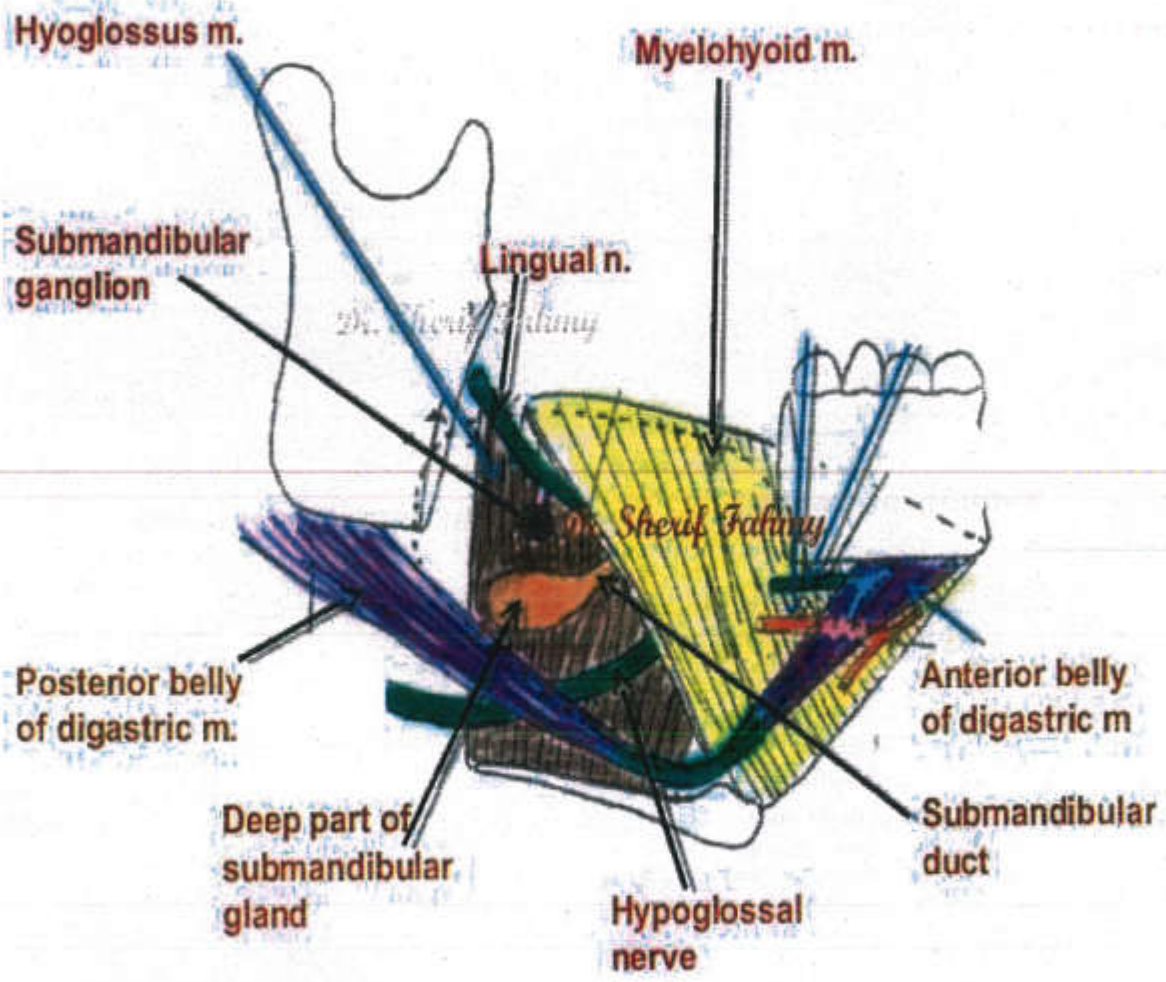
- **Definition:** It is a middle – sized major salivary gland, that secretes serous & mucus.
- **Site:** in Digastric Triangle.
- **Shape:** is a J-shaped.
- **Weight:** 10 - 20 grams.
- **Parts:**
  - Superficial part: large.
  - Deep part: small.
- **Surfaces of Superficial Part:**
  - Lateral
  - Inferior
  - Medial



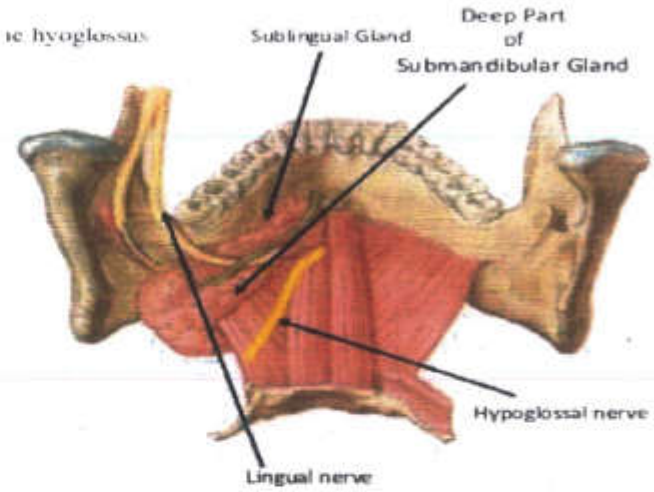
- **Relations of Superficial Part of Submandibular Gland:**
  - **Inferior surface :**
    - Skin
    - Platysma
    - Cervical branch of Facial nerve
    - Facial vein
    - Deep fascia
    - Submandibular Lymph nodes



- **Relations of Superficial Part of Submandibular Gland:**
  - **Medial surface :**
    - Mylohyoid Muscle
    - Digastric Muscle
    - Hyoglossus Muscle
    - Hypoglossal Nerve
    - Lingual Nerve
    - Deep part of Submandibular Gland
    - Submandibular Duct

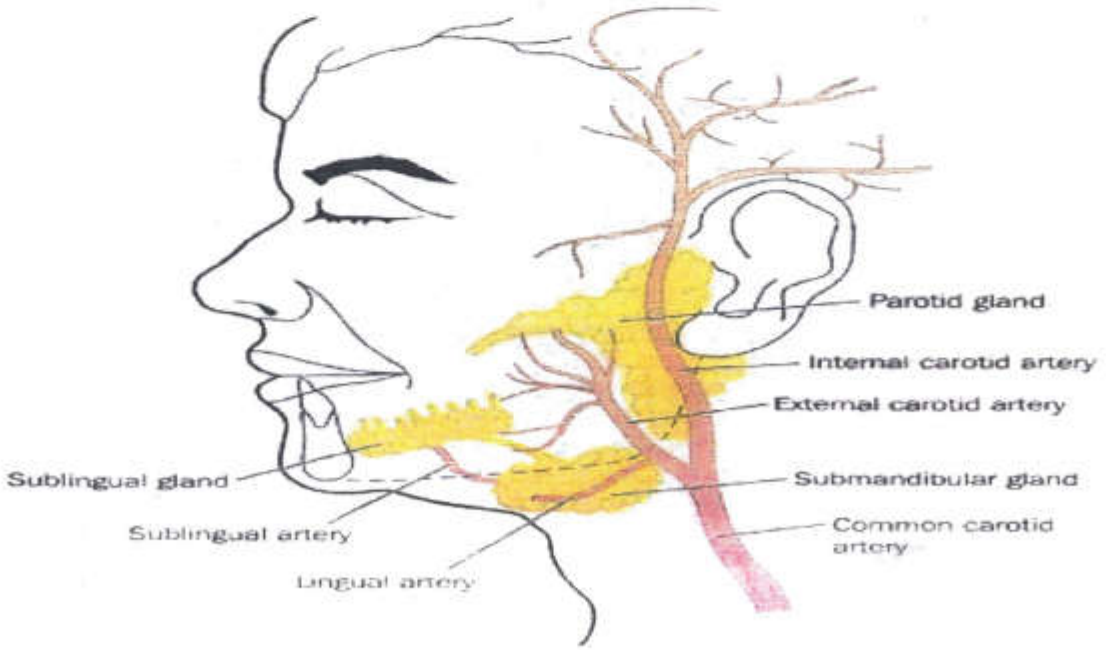


- **Relations of superficial part of Submandibular gland:**
  - **Lateral surface :**
    - Submandibular Fossa
    - Facial Artery
    - Medial pterygoid Muscle



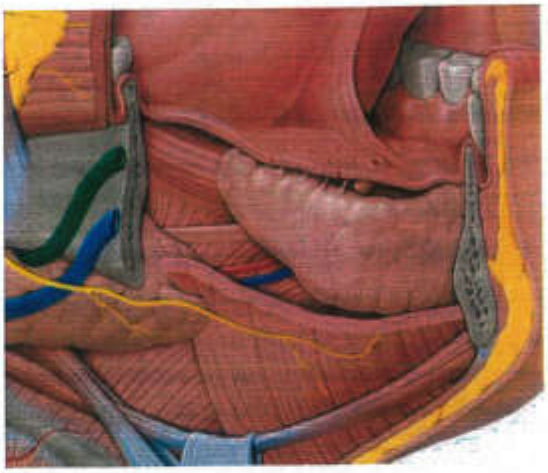
- **Relations of deep part of Submandibular gland:**
  - Mylohyoid Muscle
  - Hyoglossus Muscle
  - Lingual Nerve- above
  - Hypoglossal Nerve- below
- **Blood supply**
  - Lingual and Facial Artery
- **Venous drainage:**
  - Into Facial and Lingual Veins

- **Submandibular Duct:**
  - **Length:** thin in width & 5 cm in length.
  - **Arises from:** the medial surface of superficial part of submandibular gland.
  - **Ends by:** opening into the floor of the mouth (close to the frenum of tongue)

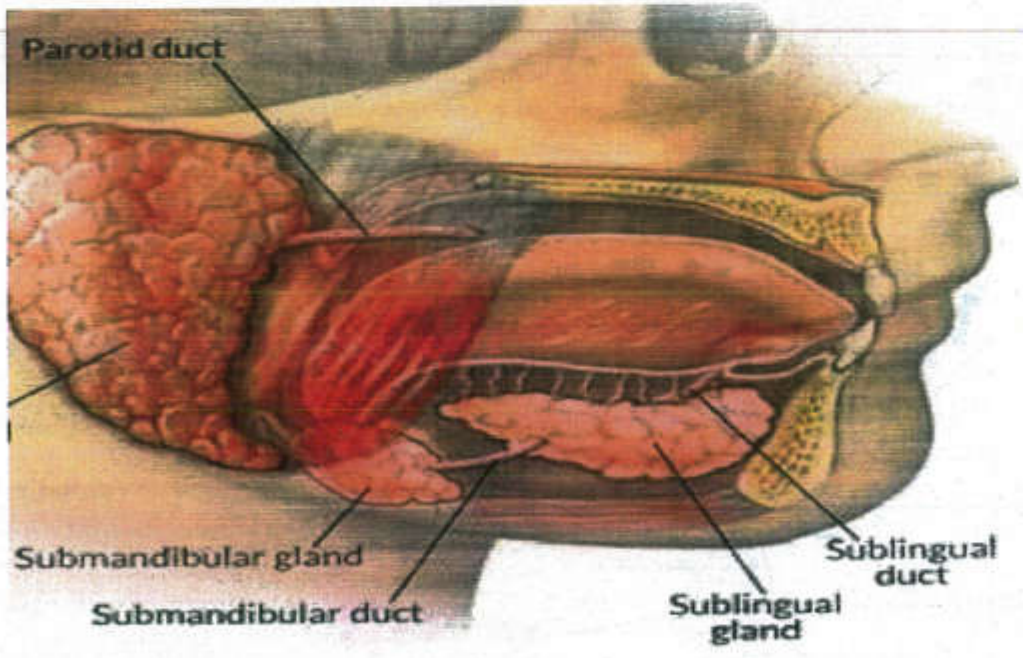


3.) Sublingual Gland:

- **Definition:** is the smallest of the salivary glands.
- **Site:** under the mucous membrane of mouth (beneath the Tongue).
- **Shape:** almond – shaped.
- **Weight:** 3 – 4 grams.
- **Relations :**
  - **Superiorly:** mucous membrane of mouth (to form sublingual fold)
  - **Inferiorly:** Mylohyoid Muscle
  - **Antero-laterally:** Sublingual fossa
  - **Medially:** Genioglossus Muscle , Lingual Nerve, Submandibular Duct



- **Blood Supply:**
  - Sublingual branch of Lingual Artery
  - Submental branch of Facial Artery
- **Venous Drainage :**
  - Into Lingual Vein & Facial Vein



- **Sublingual Ducts:**
  - Some of it goes into the submandibular duct and the rest goes into mucous membrane of the floor of the mouth.

- **Nerve Supply of Submandibular & Sublingual Glands:**
  - **Sensory fibers:** from Lingual Nerve
  - **Sympathetic fibers:** from sympathetic (cervical) plexus around facial artery.
  - **Parasympathetic fibers (secremotor):**

From

Superior Salivatory Nucleus in Pons

↓

Facial Nerve

↓

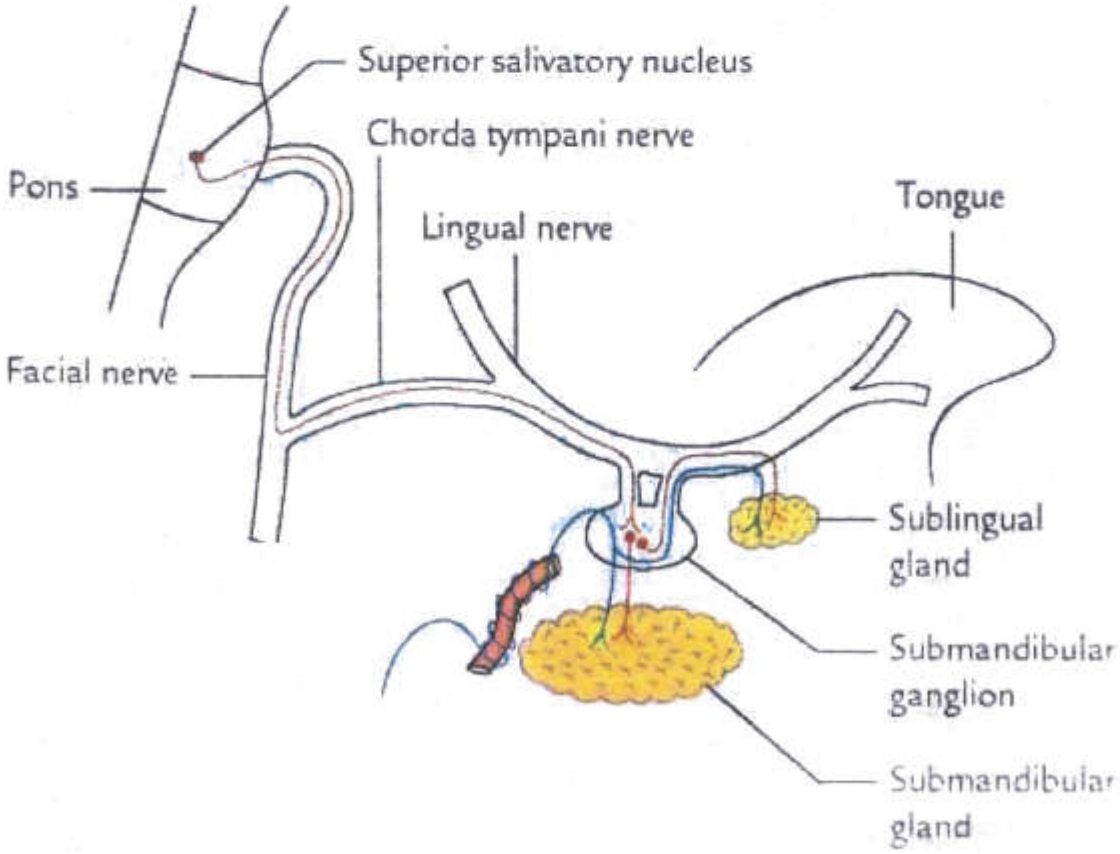
Chondrotympani branch

↓

Submandibular ganglion

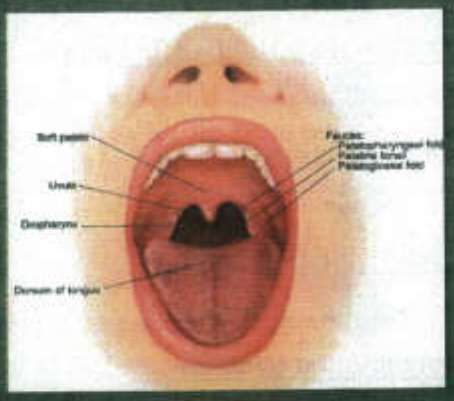
↓

Submandibular Gland ↘ **Sublingual Gland**



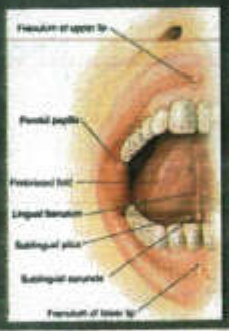
Oral Cavity (Mouth)

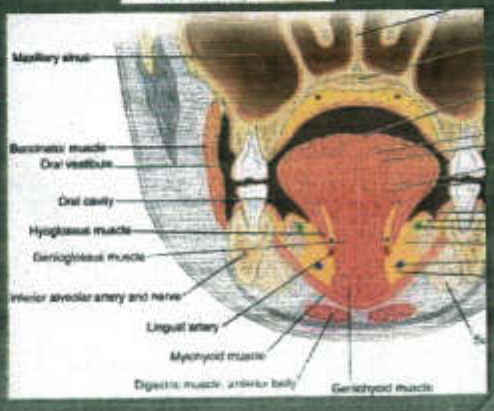
- Extends from the lips to the oropharyngeal isthmus
  - The oropharyngeal isthmus:
    - Is the junction of mouth and pharynx.
    - Is bounded:
      - **Above** by the soft palate and the palatoglossal folds
      - **Below** by the dorsum of the tongue
- Subdivided into Vestibule & Oral cavity proper



Vestibule

- Slitlike space between the cheeks and the gums
- Communicates with the exterior through the oral fissure
- When the jaws are closed, communicates with the oral cavity proper behind the 3rd molar tooth on each side
- Superiorly and inferiorly limited by the reflection of mucous membrane from lips and cheek onto the gums



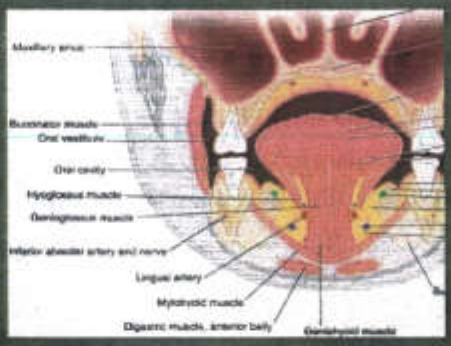


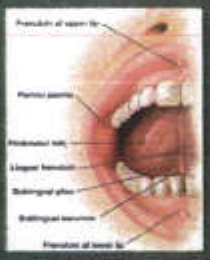
Vestibule cont'd

The lateral wall of the vestibule is formed by the cheek

- The cheek is composed of Buccinator muscle, covered laterally by the skin & medially by the mucous membrane

A small papilla on the mucosa opposite the upper 2nd molar tooth marks the opening of the duct of the parotid gland

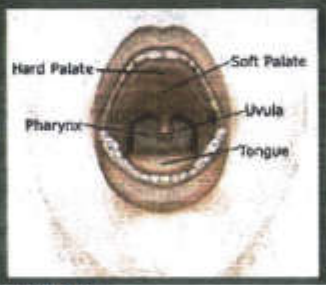


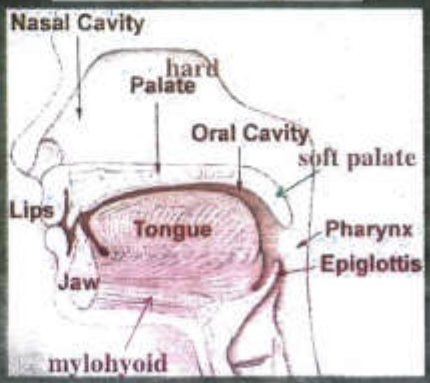


Oral Cavity Proper

It is the cavity within the alveolar margins of the maxillae and the mandible

- Its Roof is formed by the hard palate anteriorly and the soft palate posteriorly
- Its Floor is formed by the mylohyoid muscle. The anterior 2/3rd of the tongue lies on the floor.



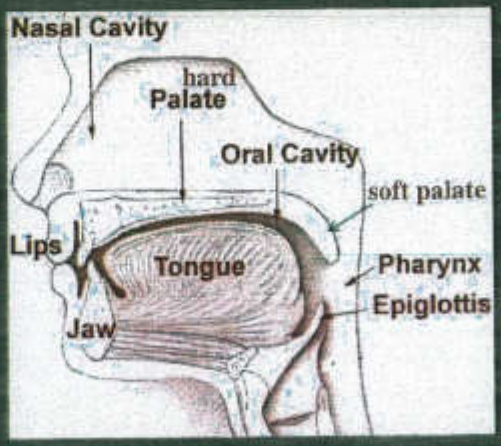


Floor of the Mouth

- Covered with mucous membrane
- In the midline, a mucosal fold, the frenulum, connects the tongue to the floor of the mouth
- On each side of frenulum a small papilla has the opening of the duct of the submandibular gland
- A rounded ridge extending backward & laterally from the papilla is produced by the sublingual gland

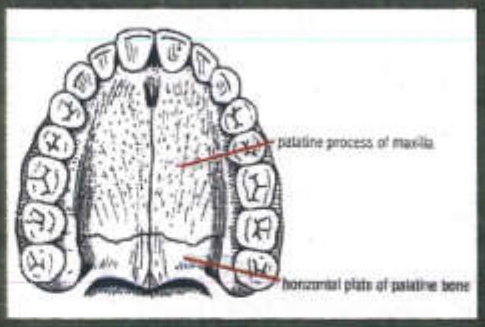
Palate

- Lies in the roof of the oral cavity
- Has two parts:
  - Hard (bony) palate anteriorly
  - Soft (muscular) palate posteriorly



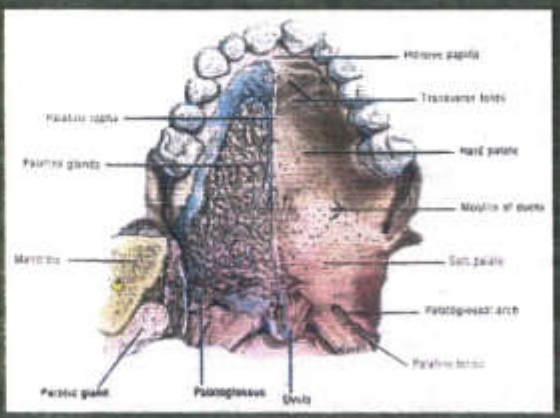
Hard Palate

- Lies in the roof of the oral cavity
- Forms the floor of the nasal cavity
- Formed by:
  - Palatine processes of maxillae in front
  - Horizontal plates of palatine bones behind
- Bounded by alveolar arches



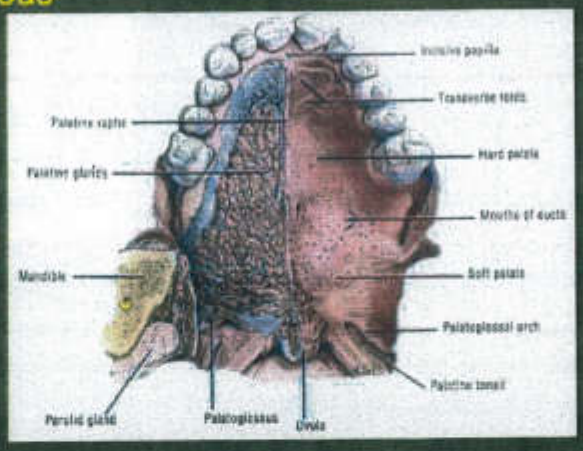
Hard Palate

- Posteriorly, continuous with soft palate
- Its undersurface covered by mucoperiosteum
- Shows transverse ridges in the anterior parts



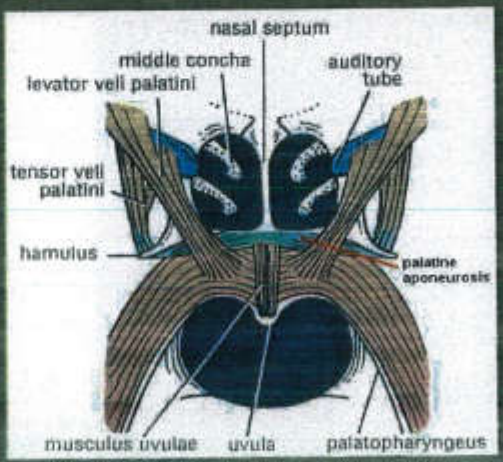
Soft Palate

- Attached to the posterior border of the hard palate
- Covered on its upper and lower surfaces by **mucous membrane**
- Composed of:
  - Muscle fibers
  - An aponeurosis
  - Lymphoid tissue
  - Glands
  - Blood vessels
  - Nerves



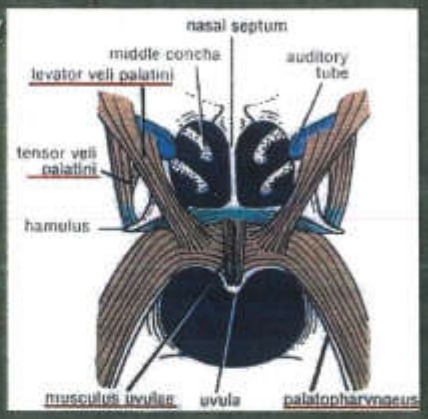
Palatine Aponeurosis

- Fibrous sheath
- Attached to posterior border of hard palate
- Is expanded tendon of **tensor velli palatini**
- Splits to enclose **musculus uvulae**
- Gives origin & insertion to palatine muscles



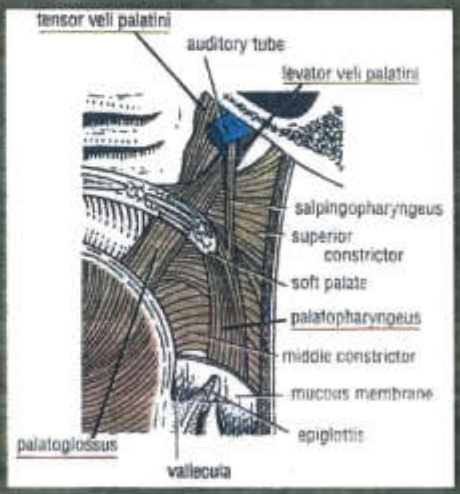
Muscles

- Tensor veli palatini
  - **Origin:** spine of sphenoid; auditory tube
  - **Insertion:** forms palatine aponeurosis
  - **Action:** Tenses soft palate
- Levator veli palatini
  - **Origin:** petrous temporal bone, auditory tube, palatine aponeurosis
  - **Insertion:** palatine aponeurosis
  - **Action:** Raises soft palate
- Musculus uvulae
  - **Origin:** posterior border of hard palate
  - **Insertion:** mucosa of uvula
  - **Action:** Elevates uvula



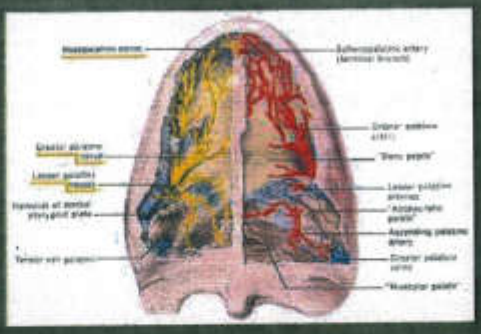
Muscles

- Palatoglossus
  - **Origin:** palatine aponeurosis
  - **Insertion:** side of tongue
  - **Action:** pulls root of tongue upward, narrowing oropharyngeal isthmus
- Palatopharyngeus
  - **Origin:** palatine aponeurosis
  - **Insertion:** posterior border of thyroid cartilage
  - **Action:** Elevates wall of the pharynx



Sensory Nerve Supply

- Mostly by the **maxillary** nerve through its branches:
  - Greater palatine nerve
  - Lesser palatine nerve
  - Nasopalatine nerve
- **Glossopharyngeal** nerve supplies the region of the soft palate

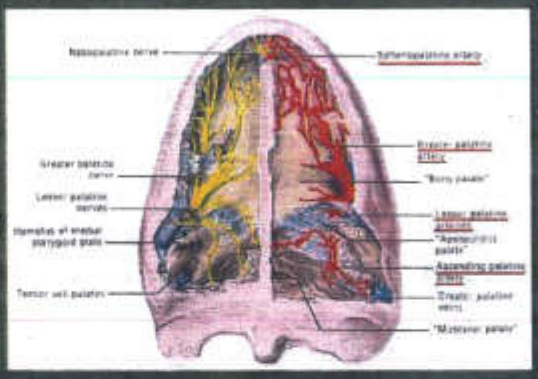


Motor Nerve Supply

- All the muscles, except **tensor veli palatini**, are supplied by the:
  - Pharyngeal plexus
- **Tensor veli palatini** supplied by the:
  - Nerve to medial pterygoid, a branch of the mandibular division of the trigeminal nerve

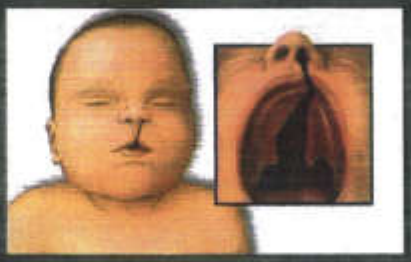
Blood Supply

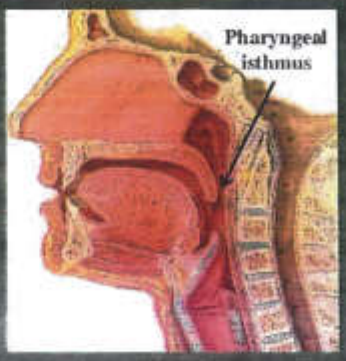
- Branches of the maxillary artery
  - Greater palatine
  - Lesser palatine
  - Sphenopalatine
- Ascending palatine, branch of the facial artery
- Ascending pharyngeal, branch of the external carotid artery



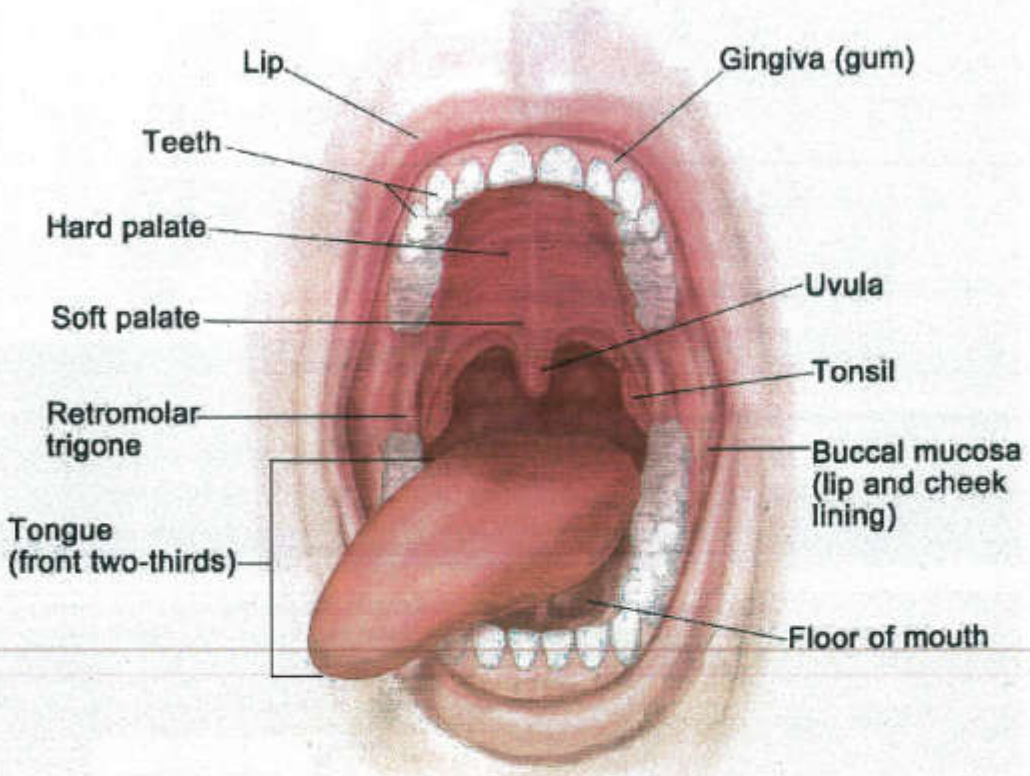
Clinical Notes

- Cleft palate:
  - Unilateral
  - Bilateral
  - Median
- Paralysis of the soft palate
  - The pharyngeal isthmus can not be closed during swallowing and speech





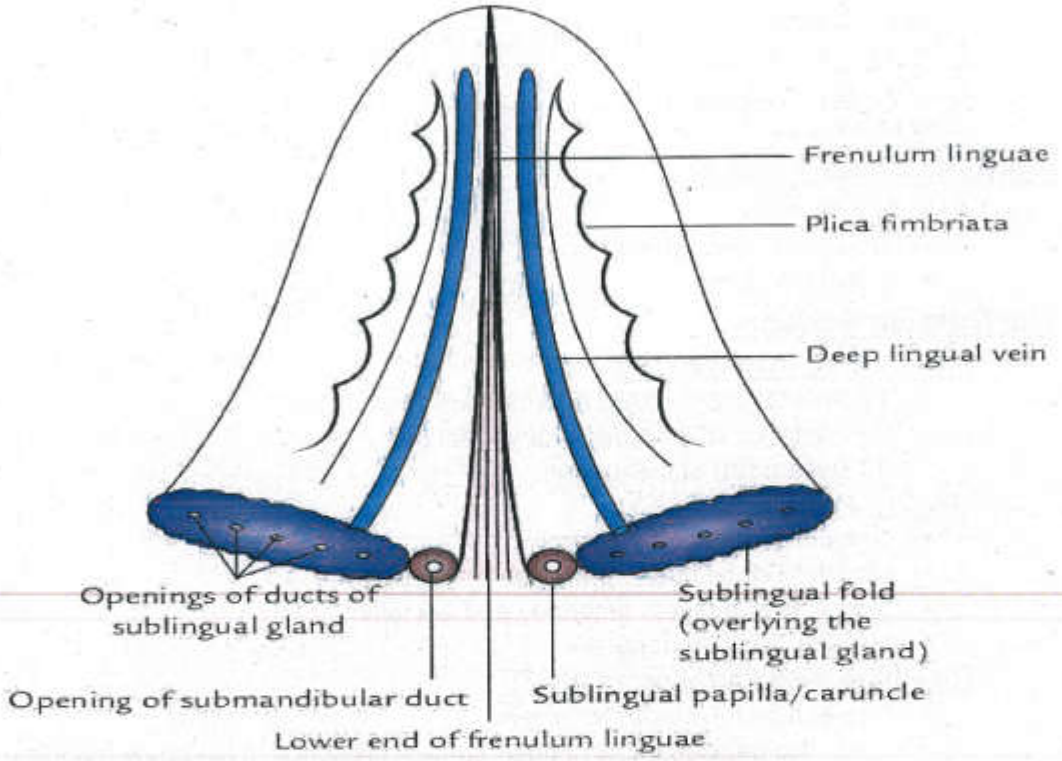
Anatomy of the Oral Cavity

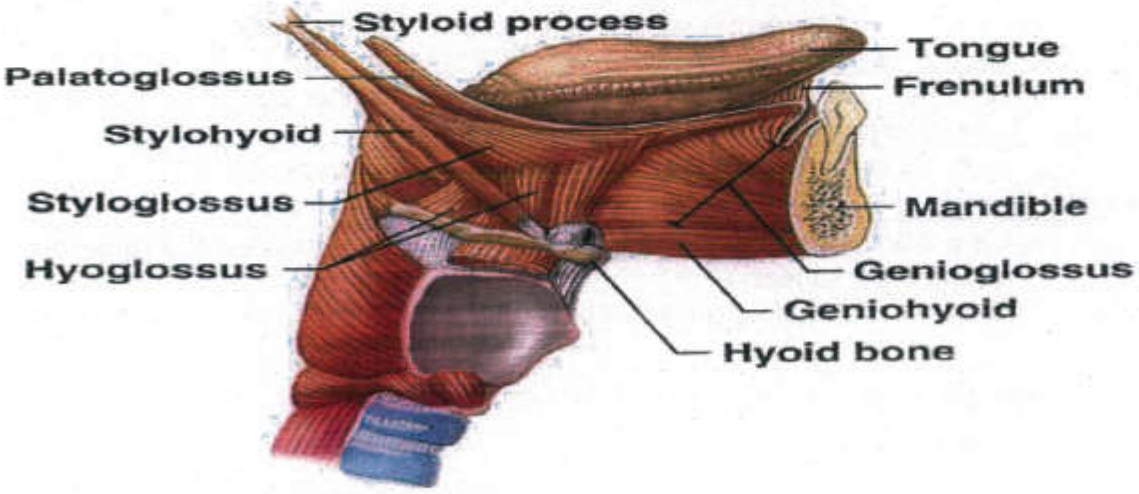


The Tongue

- **Definition:** the tongue is a solid conical muscular organ that is covered partially by the mucous membrane, and lies partly in the oral cavity and pharynx.
- **The Functions:**
  1.) Deglutition
  2.) Taste Sensation
  3.) Speech Production
  4.) Self-Cleaning System
  5.) Mastication
- **Anatomy of the Tongue:**
  - **Two Surfaces:**
    - Dorsum Surface (Superior)
    - Inferior Surface
- **The Dorsum Surface:**
  - **It's divided into 3 parts:**
    1.) Anterior 2/3 is called the oral part.
    2.) Posterior 1/3 is called pharyngeal part.
    3.) Base (root) of the tongue.
  - **The Oral Part (Anterior 2/3):**
    - Comprises of Median Furrow
    - Rough Surface due to presence of Papilae
    - Surrounded by teeth anteriorly and laterally
    - Mobile part of the tongue
  - **The Pharyngeal Part (Posterior 1/3):**
    - Lies behind the sulcus terminalis
      - No papillae show nodular surface presence of lymphatic nodules and lingual tonsils.
      - Contributes to the Anterior wall of the oropharynx
  - **Base of the Tongue:**
    - Is found in the far back and in the bottom of the tongue.
    - Contributes to the front of the wall of pharynx
    - Its movement can affect the diameter of the pharynx.
- **The Terminal Sulcus:**
  - It is a V-Shaped sulcus, which divides the dorsum of the tongue into an anterior and posterior surface.
  - The apex of the sulcus is marked by the foramen cecum.

- **Inferior Surface:**
  - It is covered by smooth mucous membrane.
  - In the midline there is a mucosal fold called frenulum or tongue tie, which connects the tongue with the floor of the mouth.
  - Lateral to frenulum, deep lingual vein can be seen through the mucosa.
  - Lateral to the lingual vein, mucosal fold called as plica fimbriata is present.



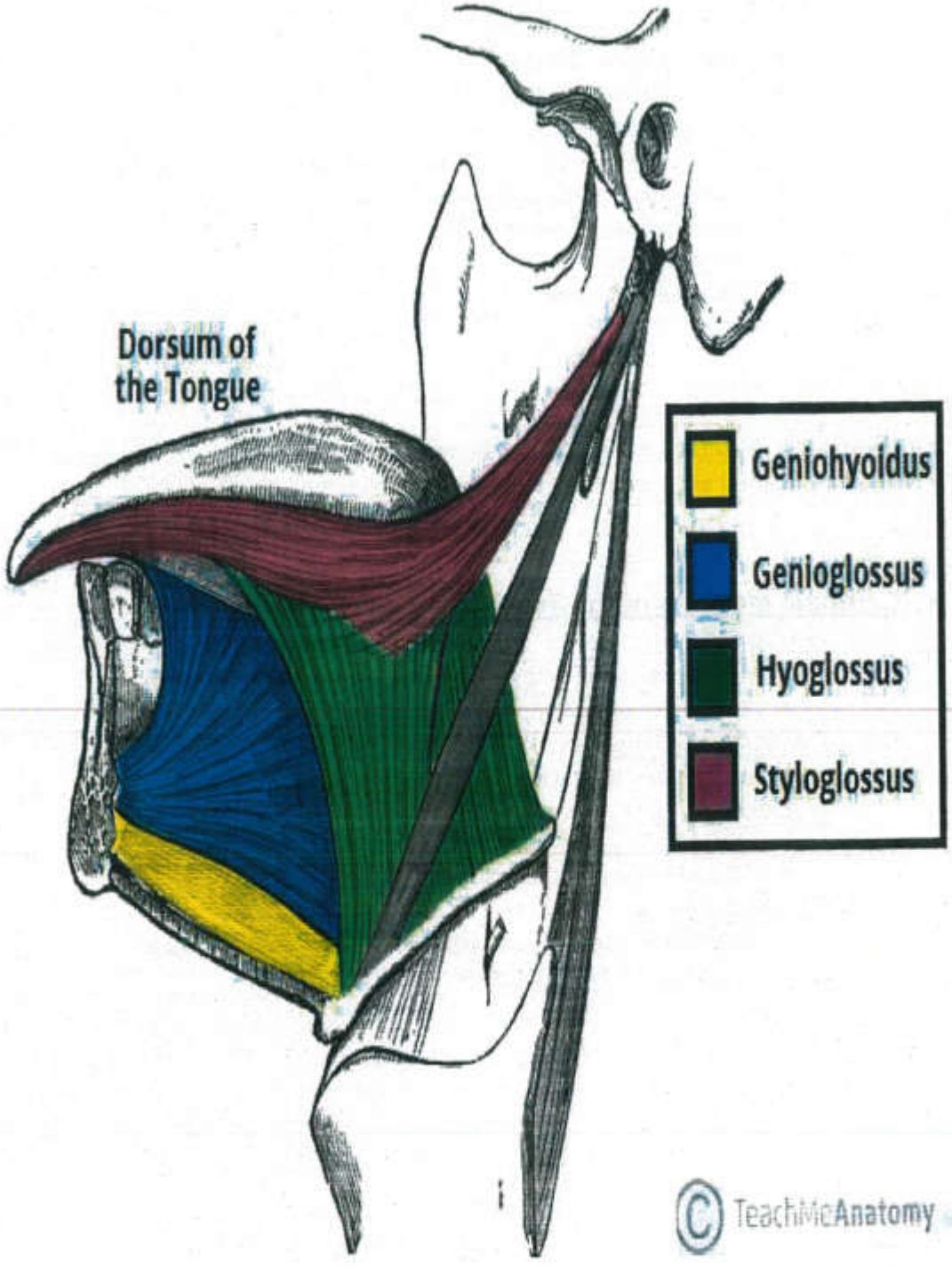


- **Muscles of the Tongue:**
  - **Extrinsic Muscles (move the tongue):**
    - Styloglossus Muscle
    - Palatoglossus Muscle
    - Genioglossus Muscle
    - Hypoglossus Muscle
  - **Intrinsic Muscles (Change the shape and size of the tongue):**
    - Superior Longitudinal Muscle
    - Inferior Longitudinal Muscle
    - Vertical Muscle
    - Transverse Muscle

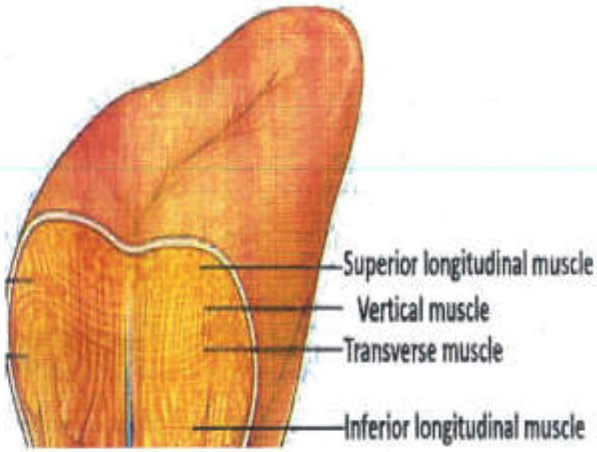
Note about Intrinsic Muscles:

- Have a role in speech, eating and swallowing.
- They are named according to the direction in which they travel.

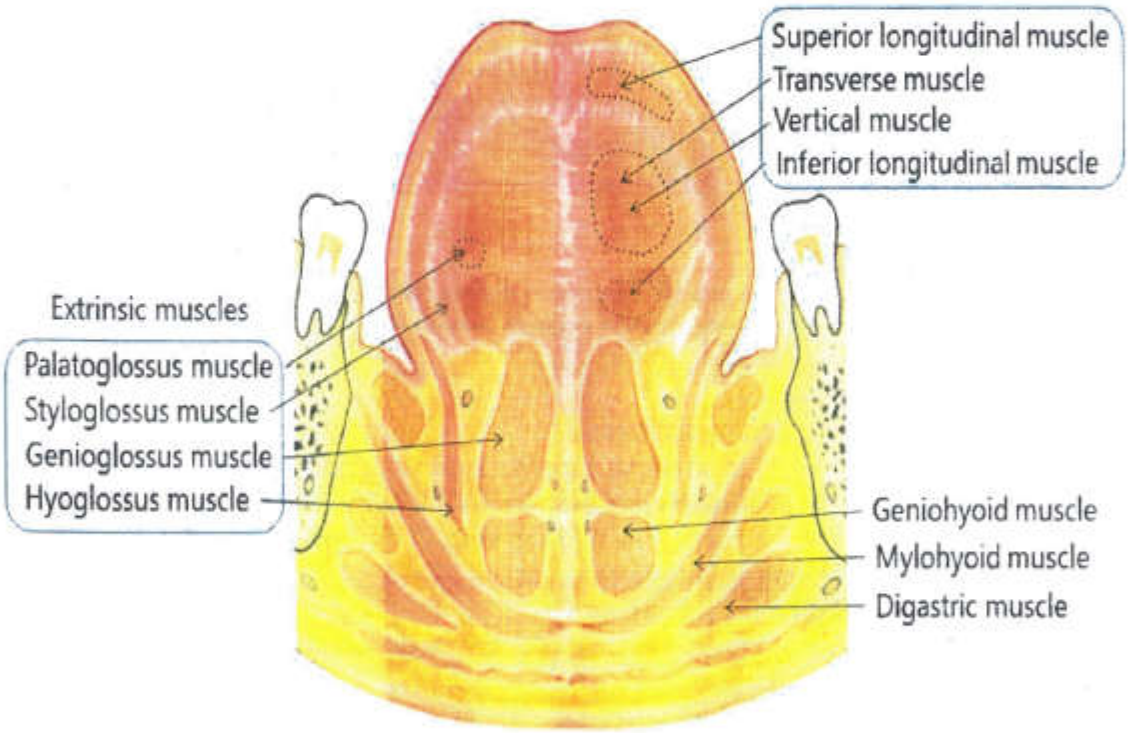
- **Extrinsic Muscles of the Tongue:**
  - **Genioglossu:**
    - It's the safety muscle of the tongue.
    - Superior Mental Sympysis
  - **Dorsum of Tongue:**
    - It protrudes the tip making the dorsal surface concave.
  - **Hypoglossus:**
    - Hyoid Bone → Side of the tongue
    - Depresses and retracts the tongue.
  - **Palatoglossus:**
    - Palatine Aponeurosis → Broadly across the tongue.
    - Elevates the posterior aspect of the tongue


Dorsum of
the Tongue
Geniohyoidus
Genioglossus
Hyoglossus
Styloglossus
© TeachMeAnatomy

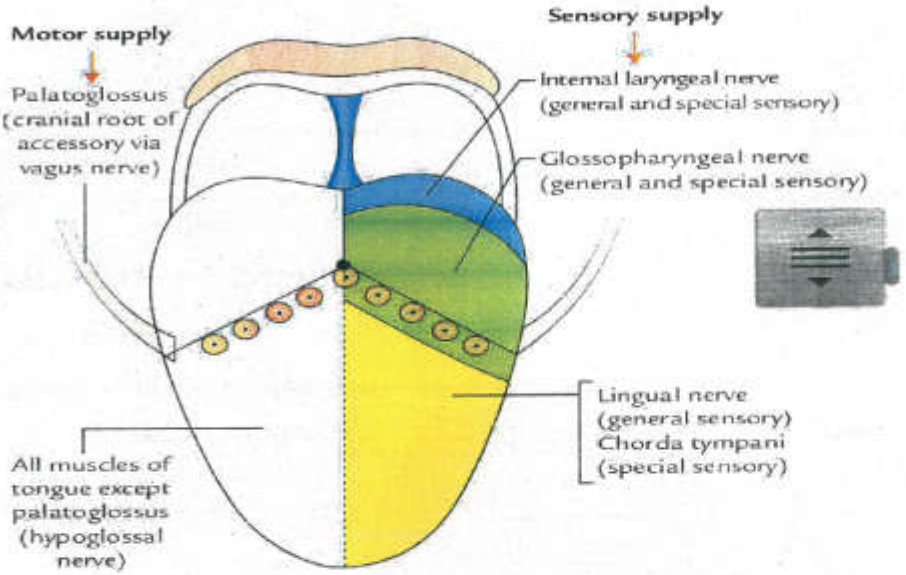
- **Intrinsic Tongue Muscles:**
  - Superior Longitudinal
    - Shortens the tongue.
    - Makes the Dorsum concave.
  - Inferior Longitudinal
    - Shortens the tongue
    - Makes Dorsum convex.
  - Vertical:
    - Makes the tongue broad and flattened.
  - Transverse:
    - Makes the tongue narrow and elongated.



Intrinsic muscles

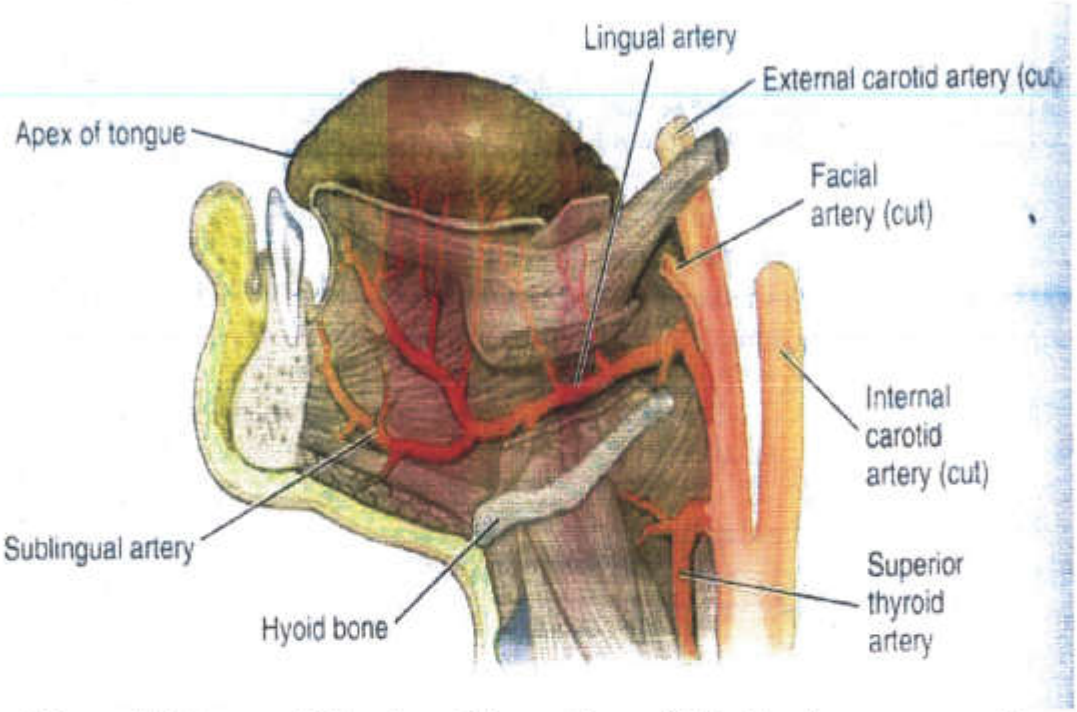


- **Innervation:**
  - **Innervation is complex and consists of 3 different supplies:**
    - Motor Supply
    - General Sensory Supply
    - Special Sensory Supply


Motor supply
Palatoglossus (cranial root of accessory via vagus nerve)
Sensory supply
Internal laryngeal nerve (general and special sensory)
Glossopharyngeal nerve (general and special sensory)
Lingual nerve (general sensory) Chorda tympani (special sensory)
All muscles of tongue except palatoglossus (hypoglossal nerve)

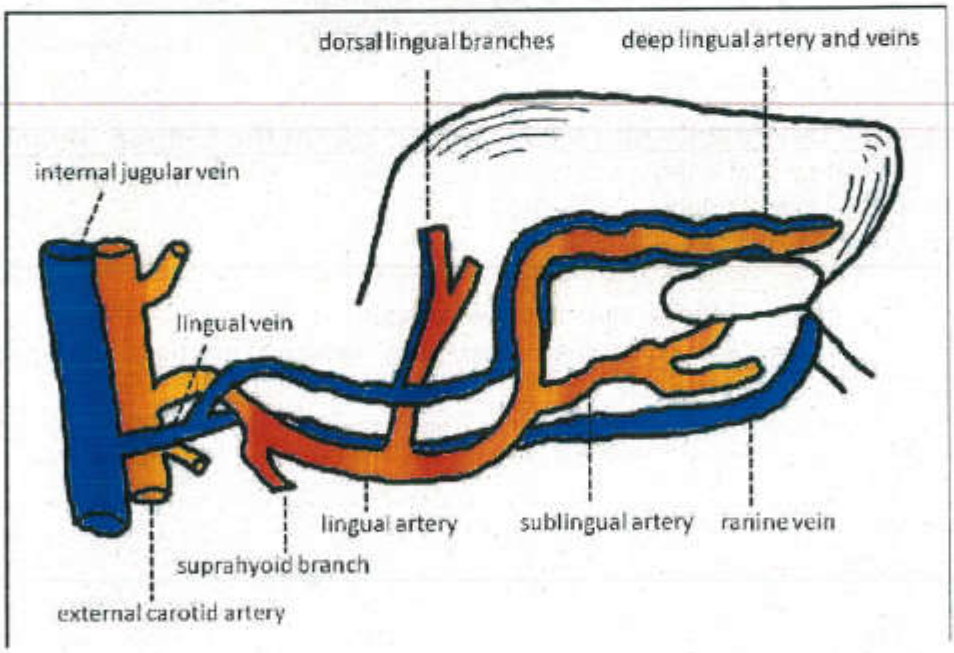
  - **Motor Supply:**
    - All extrinsic and intrinsic muscles are supplies by Hypoglossal nerve, except Palatoglossus muscle, which is supplied by Vagus Nerve.
    - General Sensory Sensation.
  - **Sensory Supply:**
    - **Supplied by 3 nerves:**
      - Lingual Nerve supplies anterior 2/3 of the tongue.
      - Glossopharyngeal Nerves supplies posterior 1/3 of the tongue.
      - Vagus Nerve supplies most of the posterior part of the tongue.
  - **Special Sensory Supply:**
    - **Supplied by 3 nerves**
      - Chorda Tympani (Facial) taste sensation of anterior 2/3 of the tongue.
      - Glossopharyngeal (ix) taste sensation of posterior 1/3 of the tongue.
      - Vagus Nerve (X) taste sensation of most of the posterior part.

- **Arterial Supply:**
  - Lingual Artery supplies tongue and floor of the mouth.
  - Originates form external carotid artery in the neck.
  - Passes between hypoglossus and genioglossus muscles of tongue.

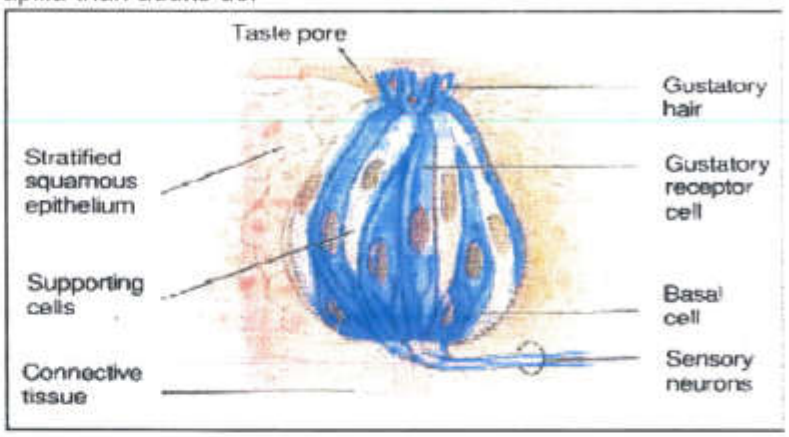


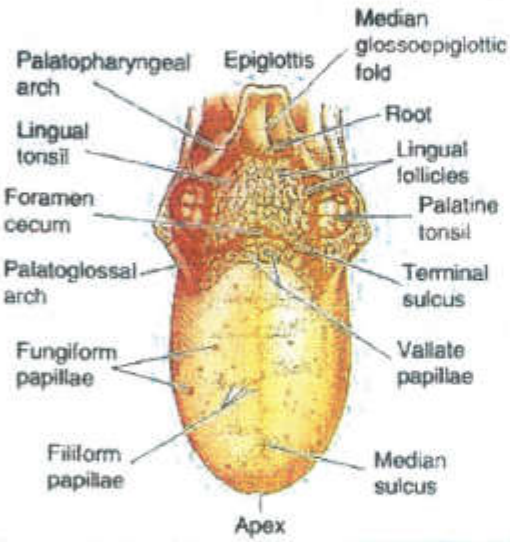
- **Lingual Artery mainly gives 3 branches within the tongue namely:**
  - Dorsal Lingual Artery
  - Deep Lingual Artery
  - Sub Lingual Artery
    - **Secondary Supply to the Tongue by:**
      - Tonsillar Branch of Facial Artery
      - Ascending Pharyngeal Artery (branch of external carotid artery)

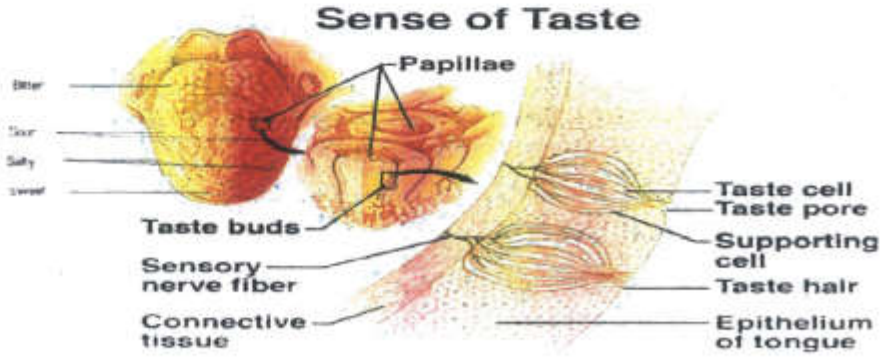
- **Venous Supply:**
  - It is drained by the Deep and Dorsal Lingual Veins.
    - **Deep Lingual Vein:**
      - Begins near the tip of the tongue and runs beneath the mucous membrane.
      - Visible on the inferior surface of the tongue.
      - Anterior tot eh lingual artery
      - Ultimately drains into the internal jugular vein.
    - **Dorsal Lingual Vein:**
      - Drains the dorsum and sides of the tongue.
      - Runs along the Lingual Artery.
      - Drains into Internal Jugular Vein
    - **Lymphatics:**
      - **Apical Vessels:**
        - Drain into Submental Nodes and deep cervical nodes.
      - **Marginal Vessels:**
        - Drain into Submandibular Nodes and deep cervical nodes.
      - **Basal Vessels:**
        - Drain into deep cervical nodes.



- **Test Buds:**
  - They are sensory structures that detect taste.
  - Most of them are specialized portions of the tongue called papillae.
  - Children have more papilla than adults do.
  - There are 4 major types of taste buds:
    - Filiform
    - Foliate
    - Vallate
    - Fungiform







TONSILS

DEFINITION : the tonsils are a pair of soft tissue masses located at the rear of the throat (pharynx).Each tonsil is composed of tissue similar to lymph node

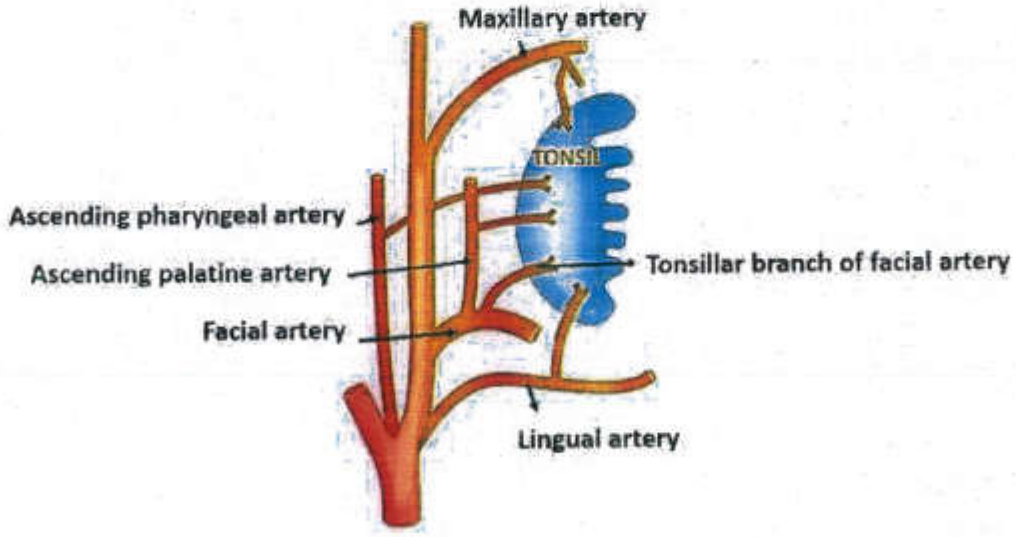
TYPES : - pharyngeal tonsil

- tubal tonsil
- palatine tonsil
- lingual tonsil

Clinical : - Tonsillitis : an inflammation of the two oval-shaped pads of tissue at the back of the throat .

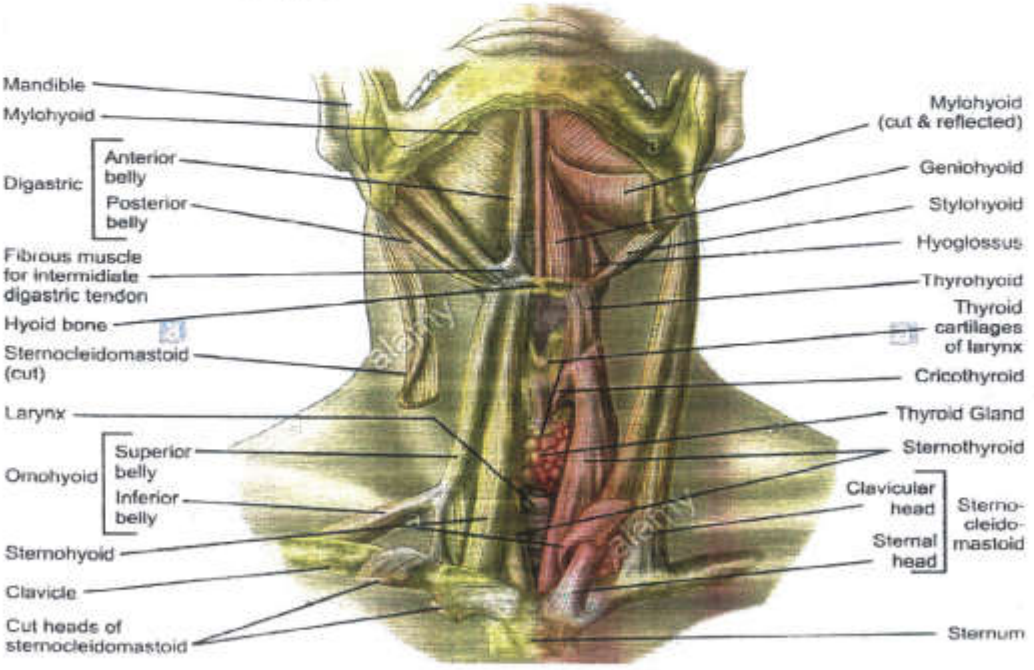
it is caused by viral infection but can be bacterial

-tonsillectomy : is the surgical procedure in which both palatine tonsils are fully removed from the back of the throat.



The Larynx (Voice Box)

- **Definition:** is a hollow, tubular structure connected to the top of the windpipe (trachea). Air passes through the larynx on its way to the lungs.
- **Function:** The larynx also produces vocal sounds and prevents the passage of food and other foreign particles into the lower respiratory tracts.
- **Site:** in the median region of the neck extending from the root of the tongue to the trachea, lying opposite to C3 to C6 cervical vertebrae in adults.
- **Relations:**
  - Anteriorly:
    - Skin
    - Fascia
    - Infrahyoid Muscles
    - Pyramidal Lobe
  - On each side:
    - Lateral Lobe of Thyroid Gland
    - Carotid Sheath
  - Posteriorly:
    - Pharynx

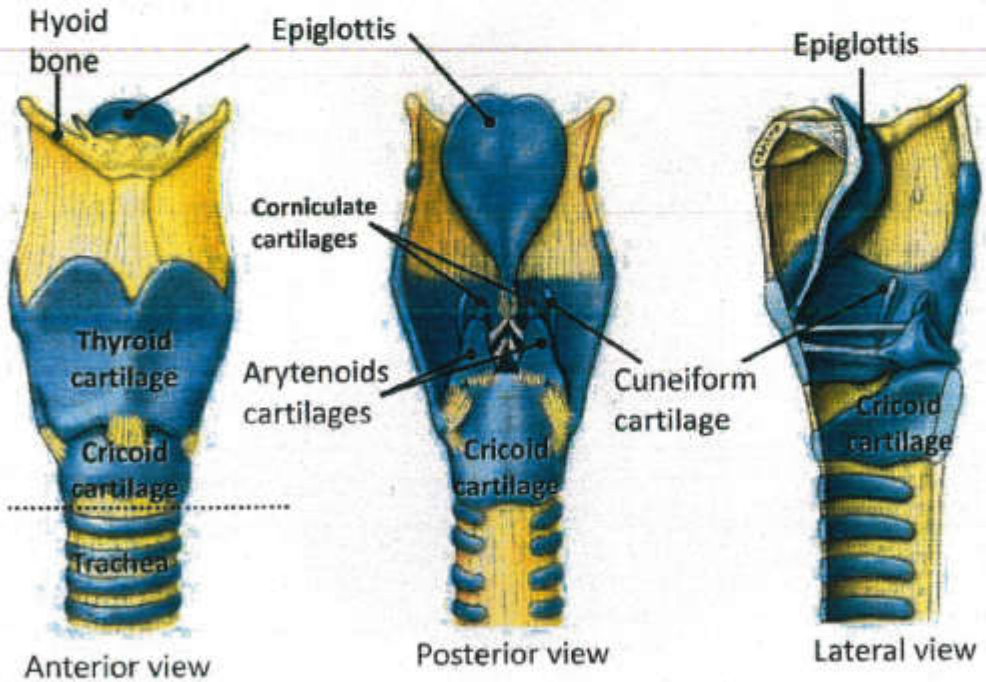


- **Structures:**
  - It is formed by a number of cartilages which are connected together by ligaments.
  - Membranes
  - Muscles
  - Some Synovial Joints

1.) **Cartilages:**

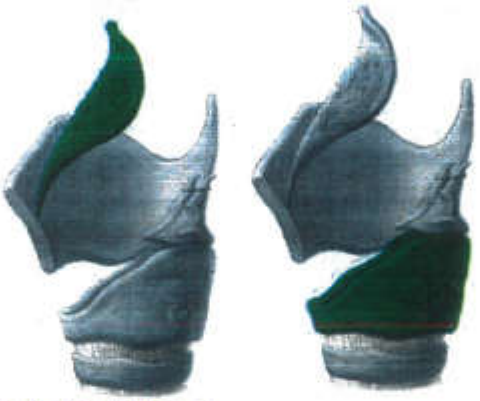
- **3 single cartilages (in the median line):**
  - Epiglottis, Thyroid Cartilage and Cricoid Cartilage.
- **3 paired cartilages (Lateral-right and left):**
  - Arytenoid Cartilages, Cornniculate Cartilages, Cuneiform Cartilages.

LARYNX CARTILAGES

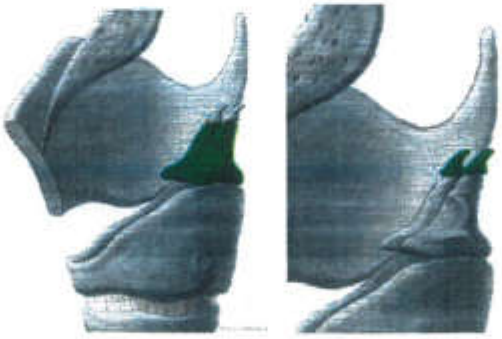


Thyroid Cartilage

Epiglottis and Cricoid Cartilages



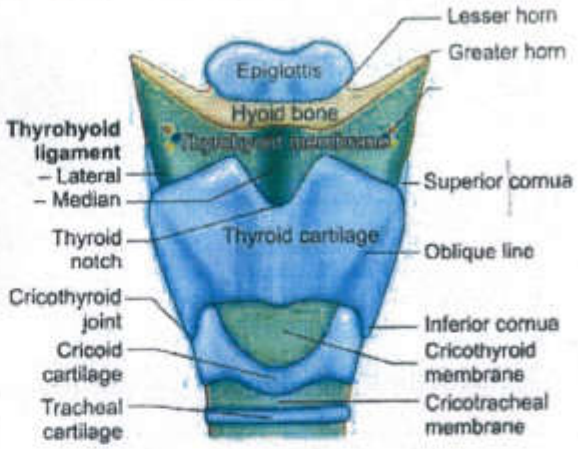
Arytenoid & Corniculate Cartilages



2.) Membranes:

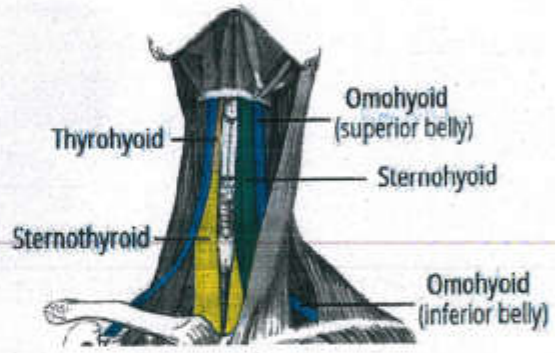
- Thyrohyoid Membrane
- Quadrate Membrane
- Cricothyroid Membrane.

LARYNGEAL FRAMEWORK - ANTERIOR VIEW



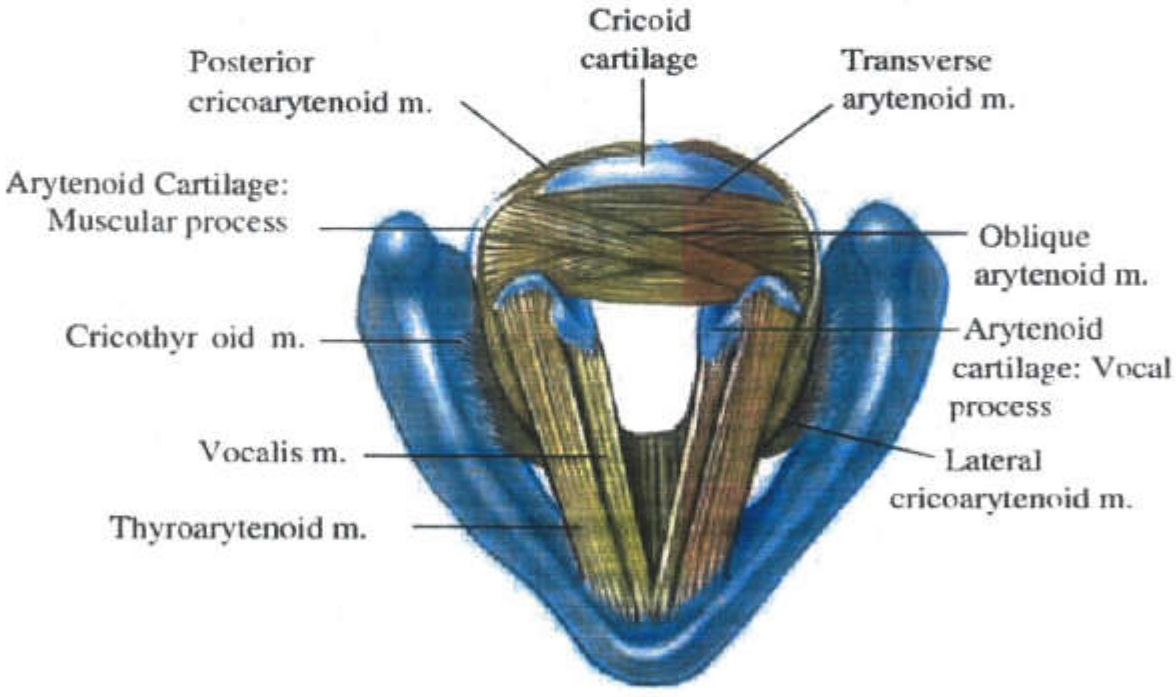
3.) Muscles:

- **Extrinsic Muscles of Larynx:**
  - These muscles attach from neighboring structures of the neck to the cartilages of Larynx. They are:
    - Infrahyoid Muscles of the anterior triangle of the neck (Thyrohyoid, Sternothyroid and Sternohyoid muscles).
    - Inferior Constrictor Muscle of pharynx.
    - Stylopharyngeus and Palatopharyngeus Muscles.
  - The extrinsic muscles move the larynx up and down during swallowing and speech.



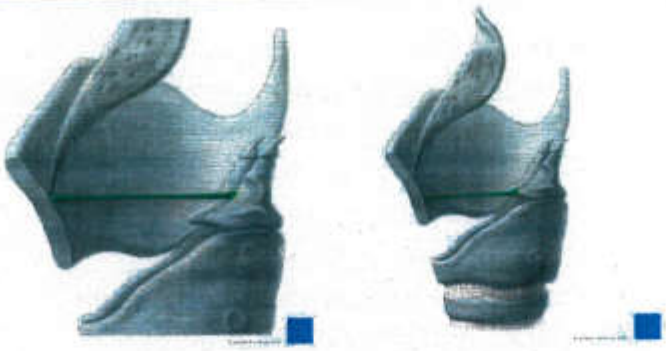
Stylopharyngeus, Palatopharyngeus and Inferior Constrictor Muscle of Pharynx

- **Intrinsic Muscles of the Larynx:**
  - The intrinsic muscles of larynx are arranged in the following groups according to their actions
    - **Muscles that open or close to the Laryngeal Inlet:**
      1.) Oblique Arytenoids: closes the inlet of Larynx.
      2.) Aryepiglotticus: closes the inlet of Larynx.
      3.) Thyroepiglotticus: opens the inlet of Larynx.
    - **Muscles that open or close the Glottis:**
      1.) Posterior Cricoarytenoids: open the glottis.
      2.) Lateral Cricoarytenoids: close the glottis.
      3.) Transverse Arytenoids: close the glottis.
    - **Muscles that increase or decrease the tension of vocal cords:**
      1.) Cricothyroid: tense the vocal cords.
      2.) Thyroarytenoid: relax the vocal cords.
      3.) Vocalis: tense the vocal cords.

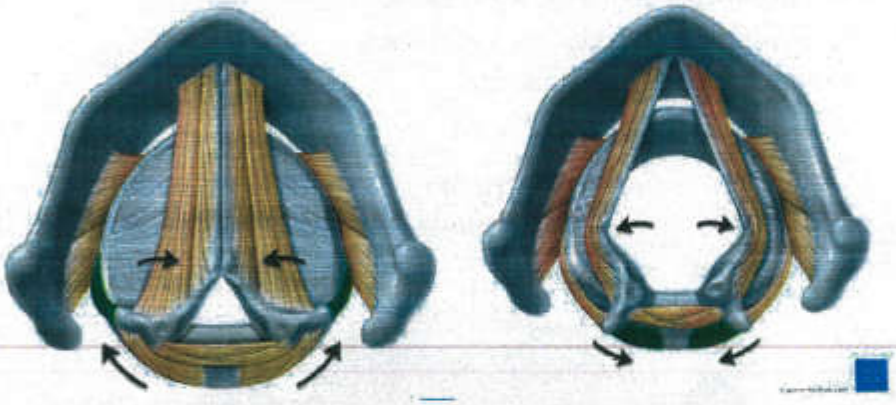


Top View
(epiglottis removed)

Vocal Ligament and Vetstibular Ligament

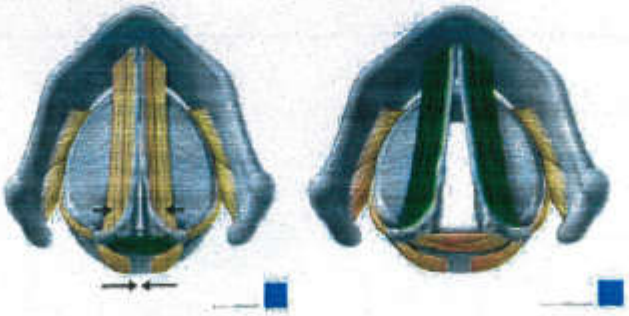


Action of Lateral Cricoarytenoid and Posterior Cricoarytenoid Muscles



Action of,

1- Transvers and oblique of arytenoids
2- Vocalis and thyroarytenoid muscles



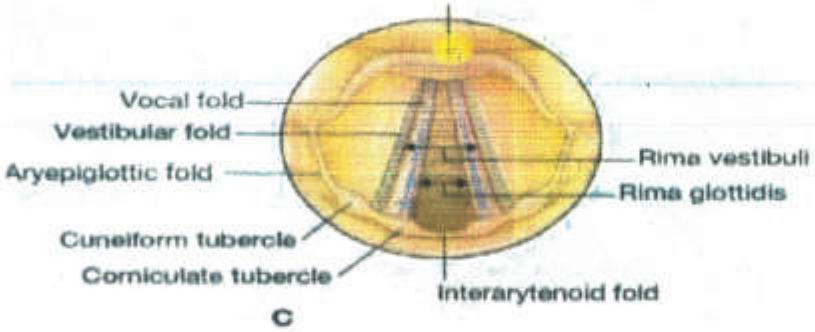
Rima Glottidis and Rima Vestibule

Rima glottidis

- Triangular opening between the two adjacent vocal folds.

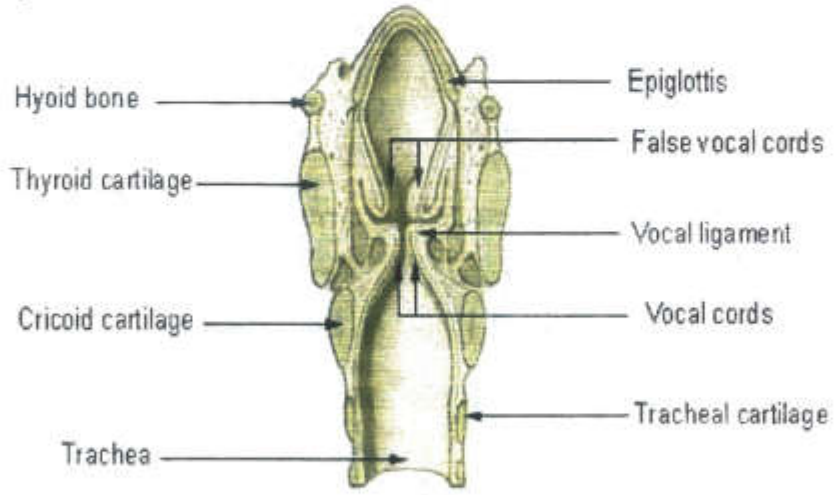
Rima vestibule

- Triangular opening between the two adjacent vestibular folds.

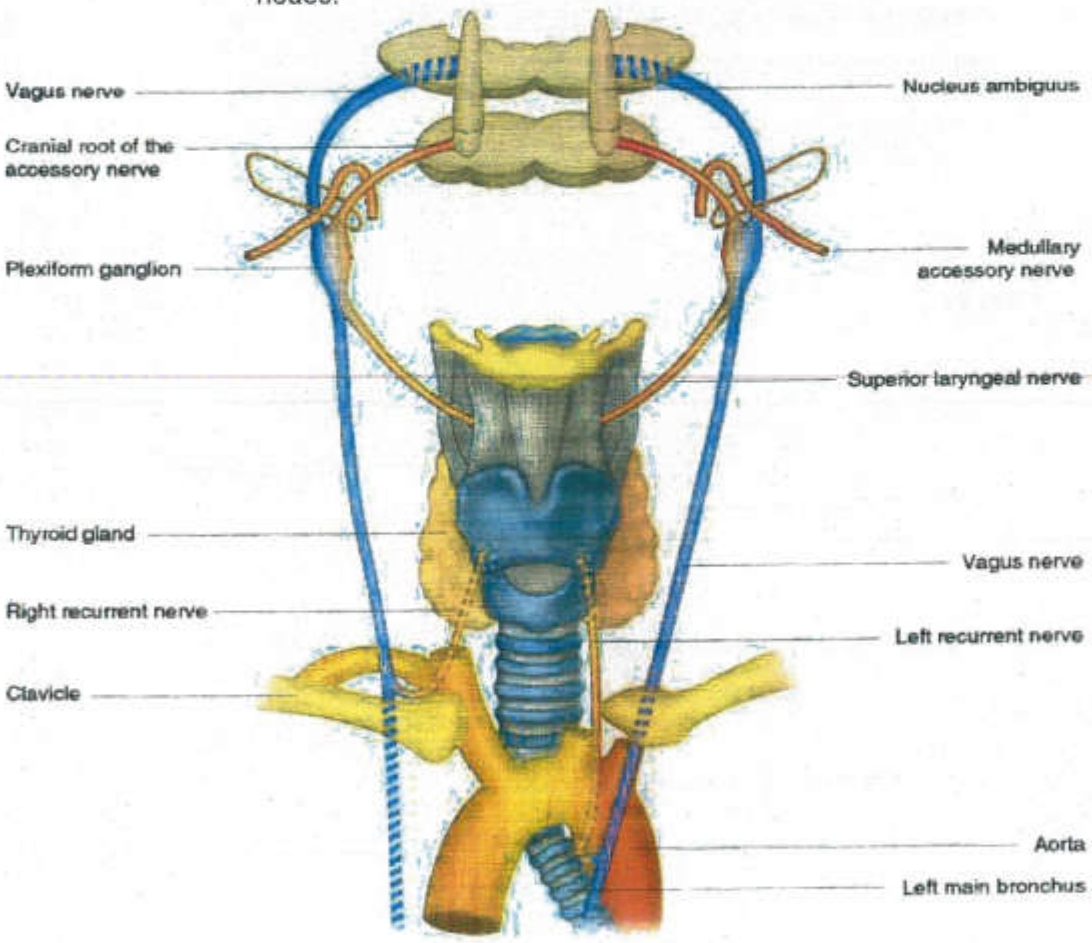


C

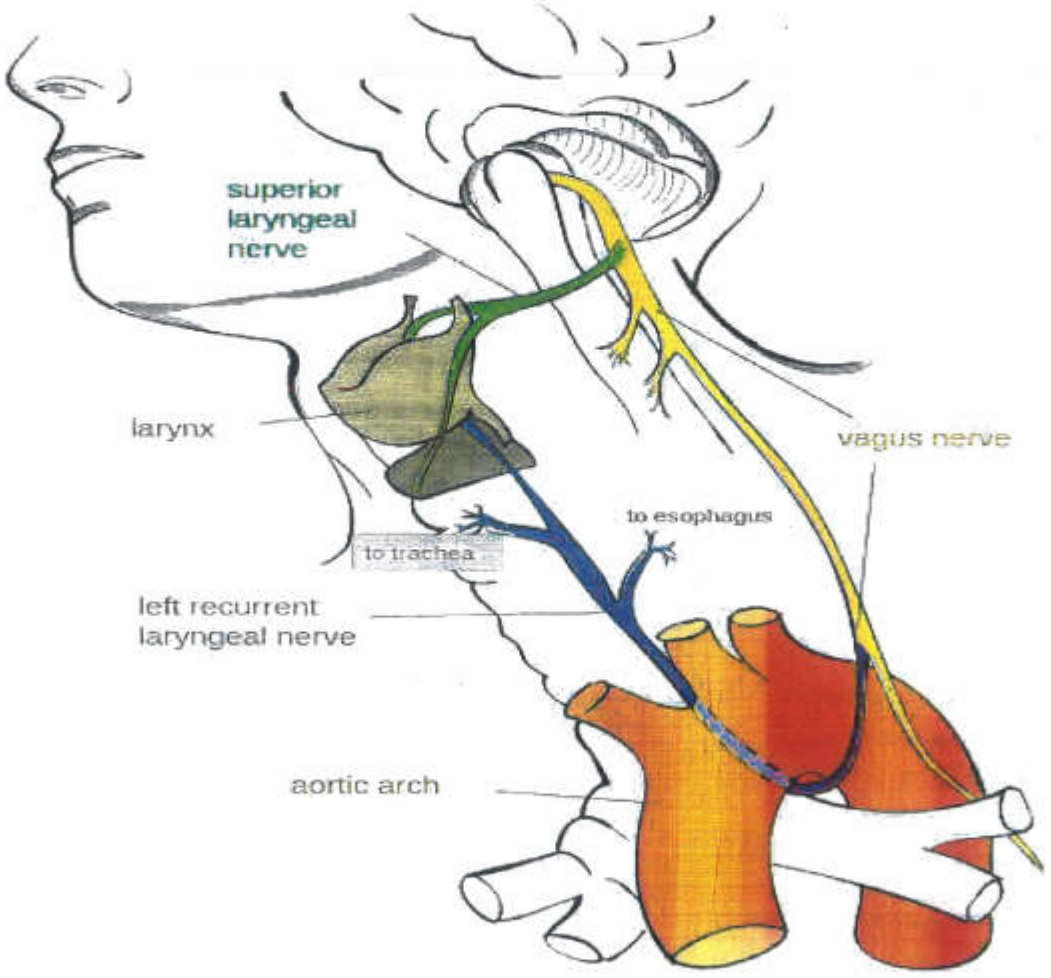
Larnyx



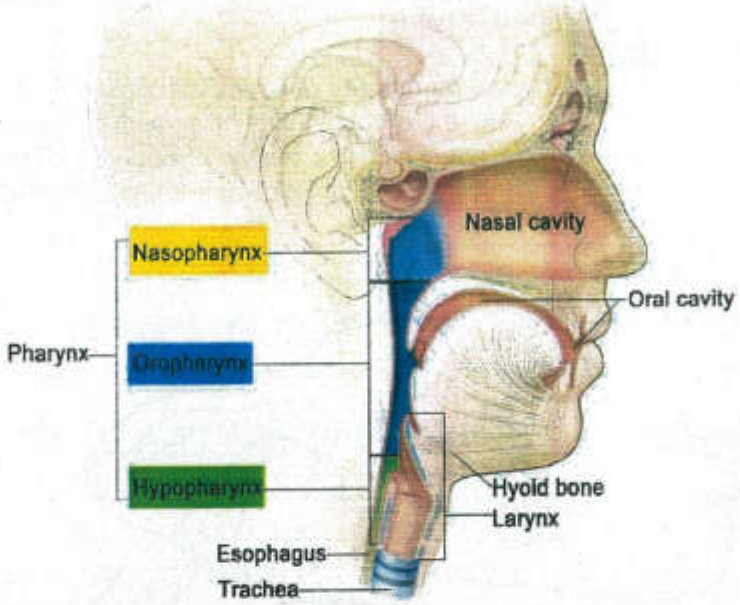
- **Blood Supply:**
  - **Above the Vocal Folds:**
    - Superior Laryngeal Artery
    - Branch of Superior Thyroid Artery
  - **Below the Vocal Folds:**
    - Inferior Laryngeal Artery
    - Branch of Inferior Thyroid Artery
- **Venous Drainage:**
  - Into Superior and Inferior Laryngeal Veins
- **Lymphatic Drainage:**
  - Into deep cervical lymph nodes
    - All the head and neck structures drain into deep cervical lymph nodes.



- **Nerve Supply:**
  - **Motor:**
    - All the intrinsic muscles of the larynx are supplied by the recurrent laryngeal nerve except cricothyroid which is supplied by external laryngeal nerve.
  - **Sensory:**
    - The mucus membrane of larynx is supplied by two nerves:
      - Above the Vocal Folds: it is supplied by the Internal Laryngeal Nerve, which is a branch of Superior Laryngeal Nerve.
      - Below the Vocal Folds: it is supplied by Recurrent Laryngeal Nerve.



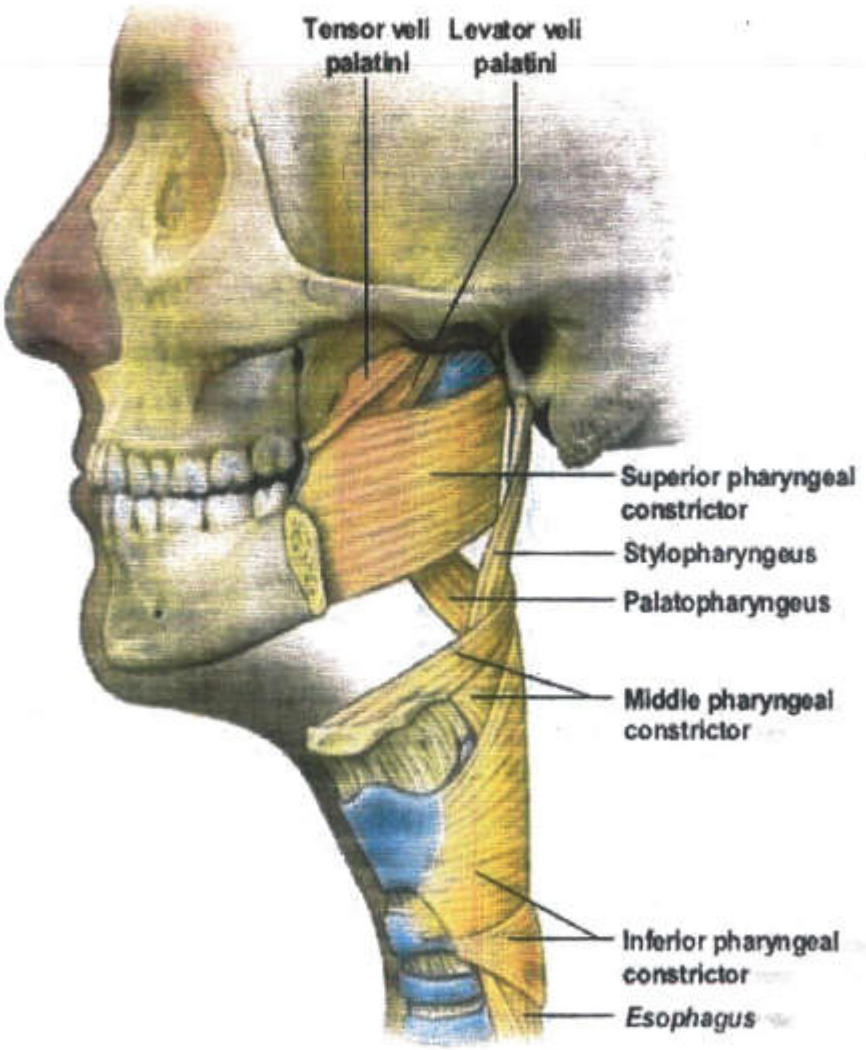
Pharynx



- **Definition:** It's a 12 cm muscular tube extending from the base of skull to the level of lower border of C6 vertebrae.
- **It's Divided into 3 parts:**
  1.) Nasopharynx
  2.) Oropharynx
  3.) Laryngopharynx
- **Structure:**
  - **It is made up of 5 layers:**
    - Mucous Membrane
    - Submucosa Coat
    - Pharyngo-Basilar Fascia
    - Pharyngeal Muscle
    - Buccopharyngeal Fascia
- **Muscles of Pharynx:**
  - 3 Constrictor Muscles
  - 3 other muscles

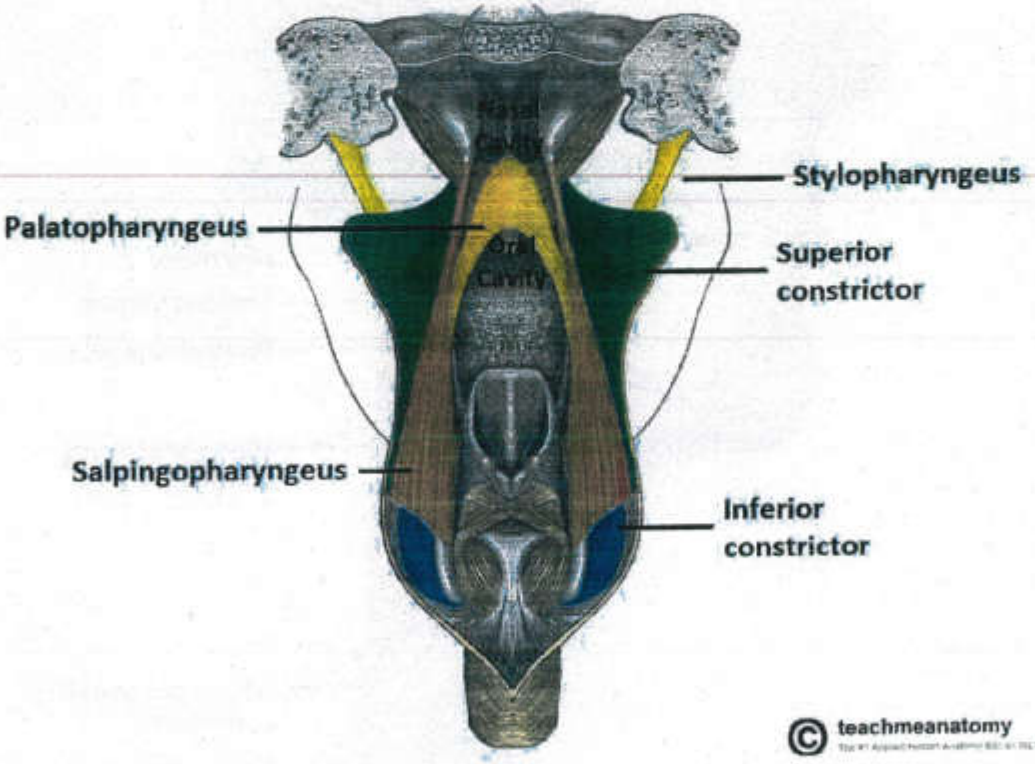
Constrictor Muscles

Muscle	Origin	Insertion
Superior Constrictor	Pteryopgomandinular Ligament, pterygoid Hummulus & mylohyoid line.	All of them are inserted into fibrous median raphe.
Middle Constrictor	Lower part of stylohyoid ligament &2 horns of hyoid bone.	
Inferior Constrictor	Upper border of thyroid cartilage to lower border of cricoid cartilage of larynx (it's extension of origin)	

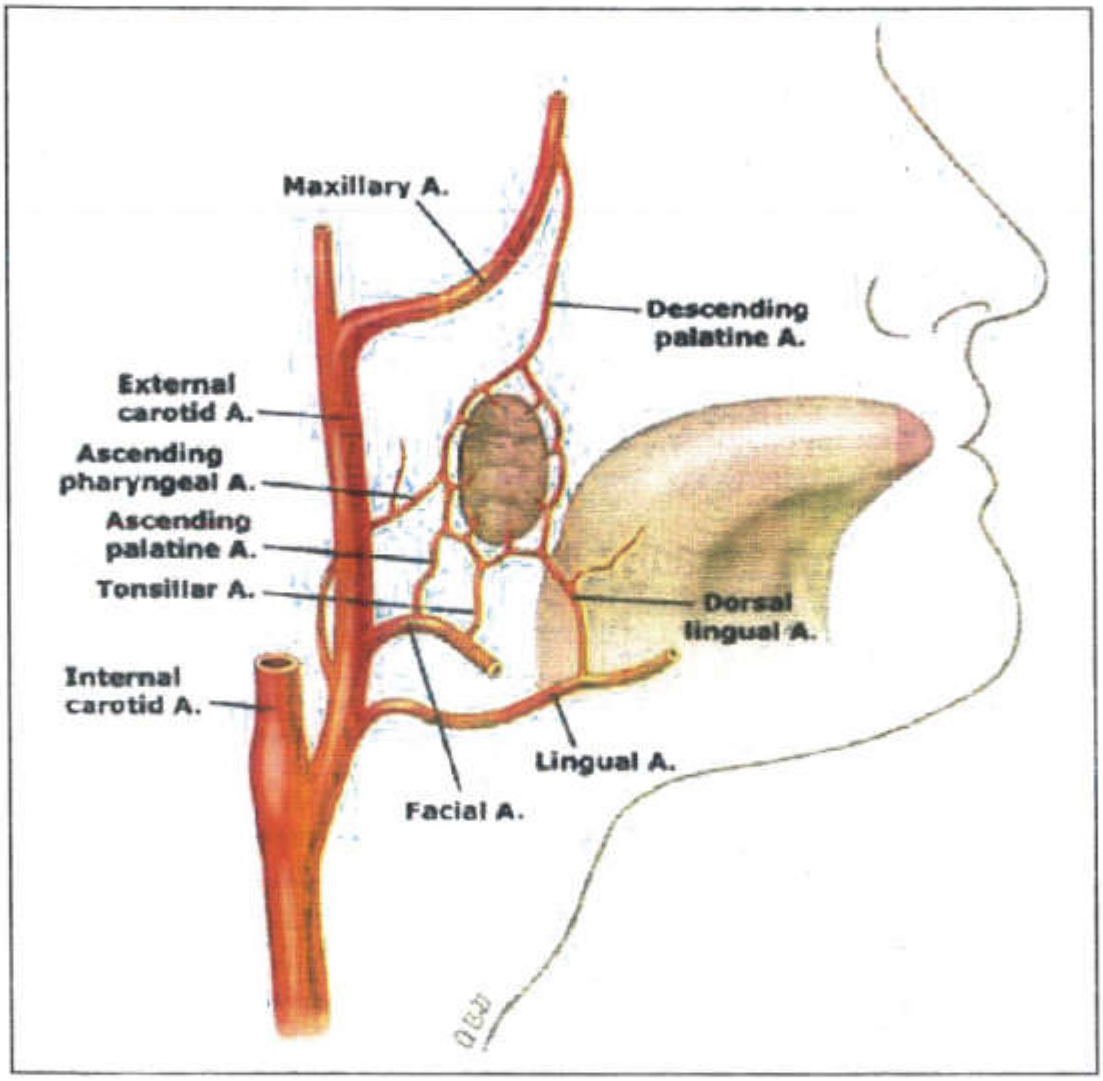


Other Muscles

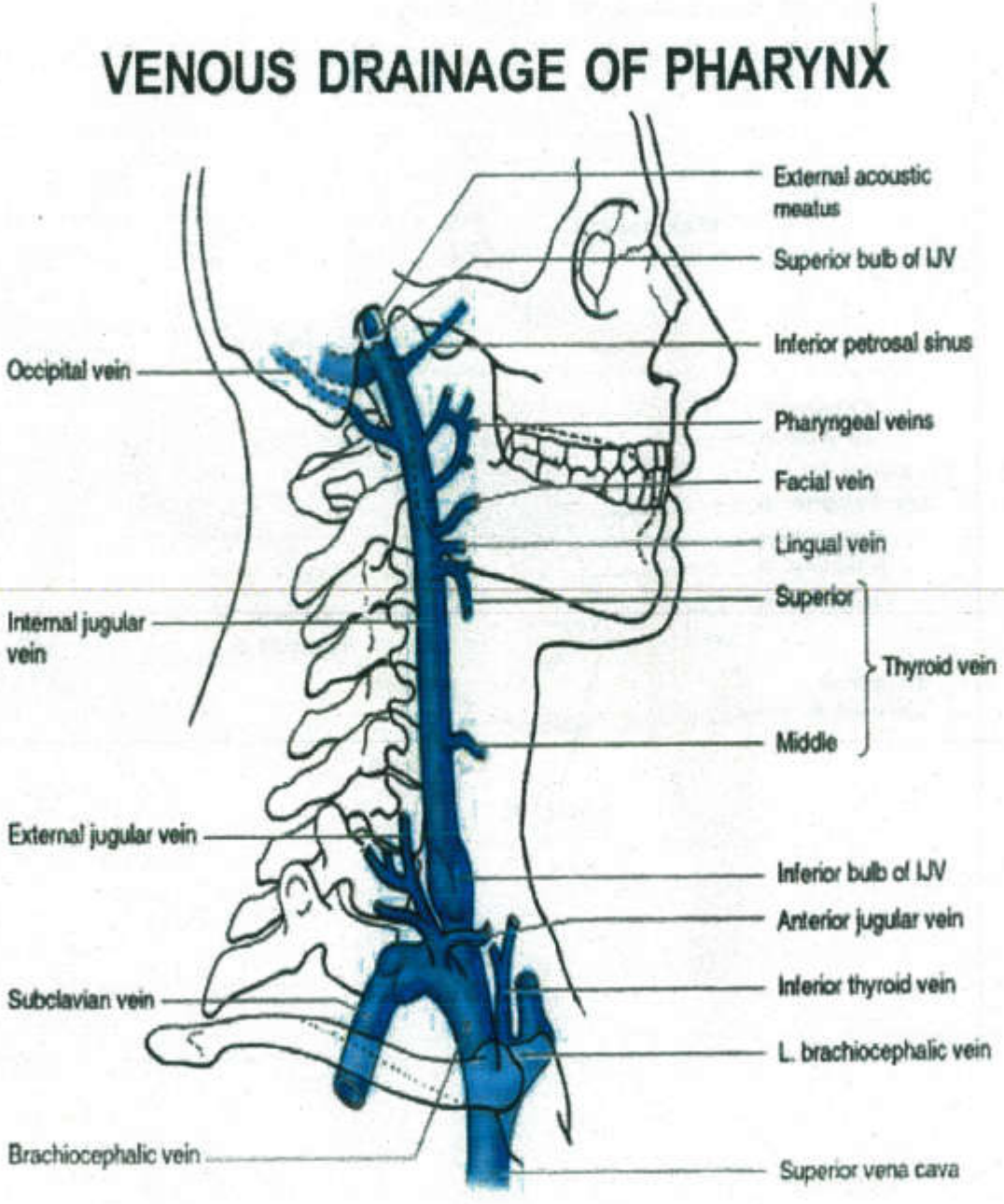
Muscle	Origin	Insertion	Action	Nerve supply
Stylopharyngeus Muscle	Styloid process	Post. Border of lamina of thyroid cartilage.	Elevates pharynx & larynx during swallowing	Glossopharyngeal
Palato-pharyngeus Muscle	Palatine aponeurosis	=	=	Pharyngeal plexus of nerves
Salpingo-pharyngeus Muscle	Eustachian (Auditory tube) tube	=	= + keeps Eustachian tube patent	=



- **Nerve Supply of Pharynx:**
  - Pharyngeal Plexus.
- **Blood Supply:**
  1.) Ascending Pharyngeal Branch of E.C.A
  2.) Ascending Palatine Branch of Facial Artery
  3.) Pharyngeal Branch of Superior Thyroid Artery
  4.) Pharyngeal Branch of Inferior Thyroid Artery



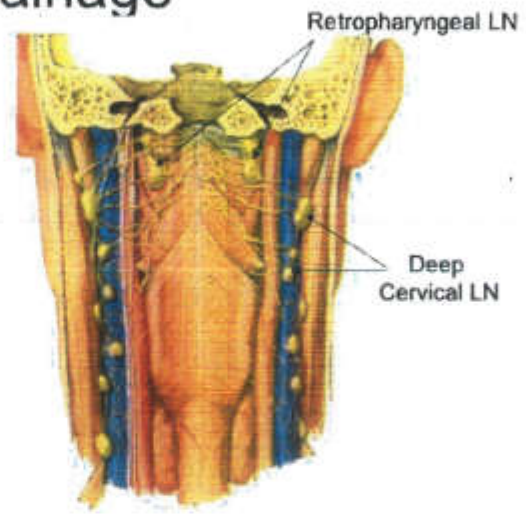
- **Venous Drainage:**
  - Into the pharyngeal plexus or veins
  - Facial Vein
  - Inferior Vena Cava (I.V.C.)



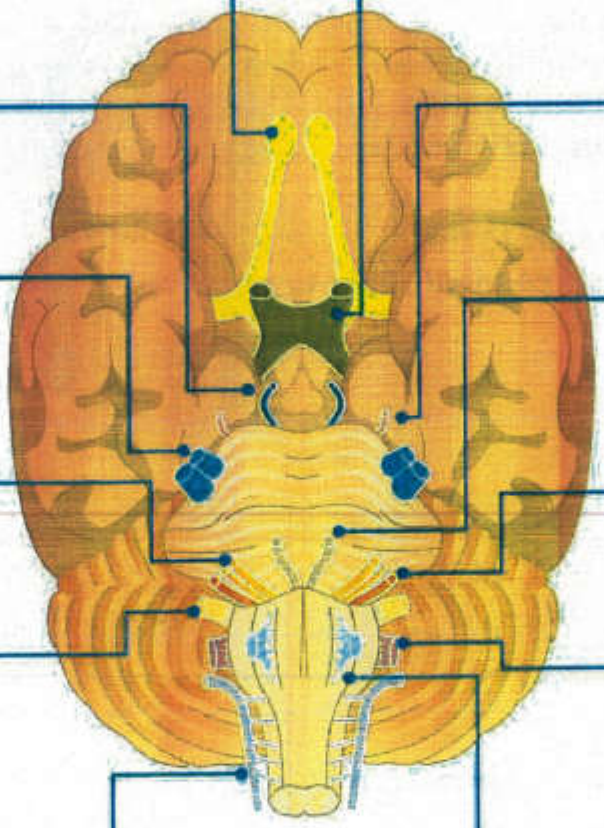
- **Lymphatic Drainage:**
  - Into the Retropharyngeal and the Deep Cervical Lymph Nodes

Lymphatic drainage

- To the retropharyngeal LN and then to deep cervical LN
- Directly to the deep cervical LN



Cranial Nerves



olfactory
smell

oculomotor
eye movement and pupil reflex

trigeminal
face sensation and chewing

facial
face movement and taste

glossopharyngeal
throat sensation, taste, and swallowing

accessory
neck movement

optic
vision

trochlear
eye movement

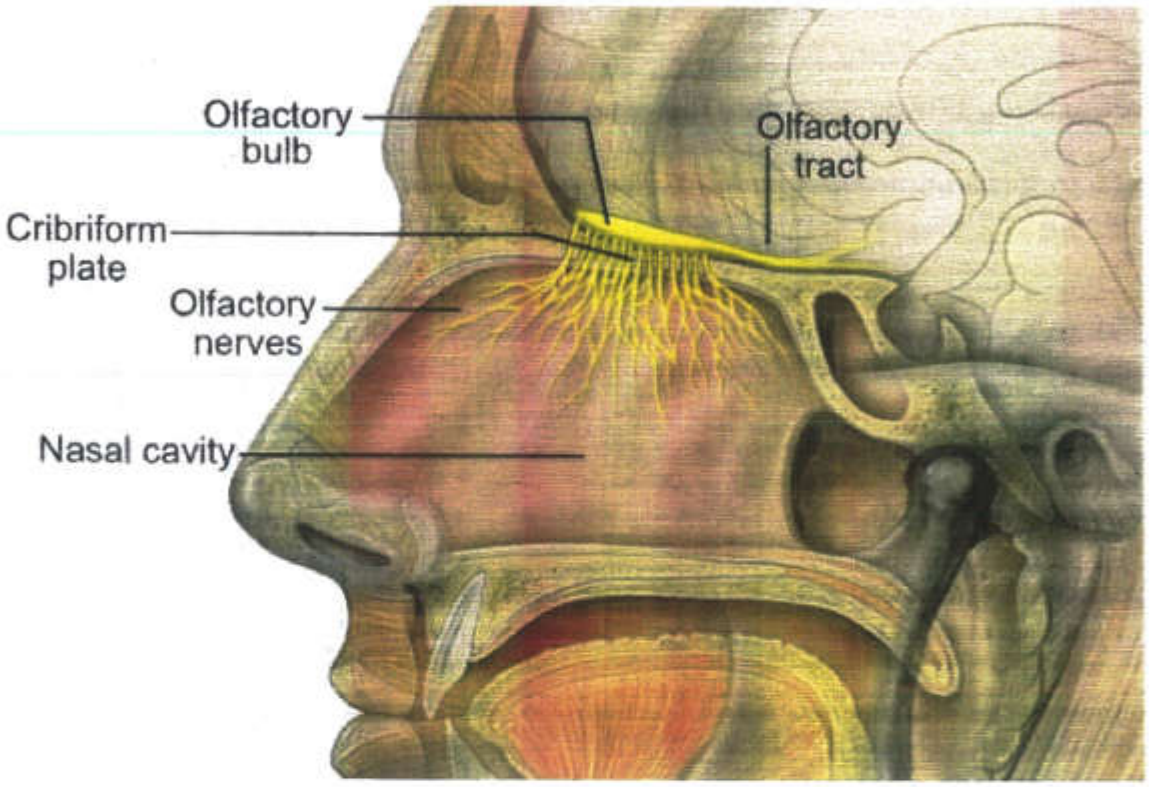
abducens
eye movement

vestibulocochlear
hearing and balance

vagus
movement, sensation, and abdominal organs

hypoglossal
movement, sensation, and abdominal organs

1.) OLFACTORY NERVE I



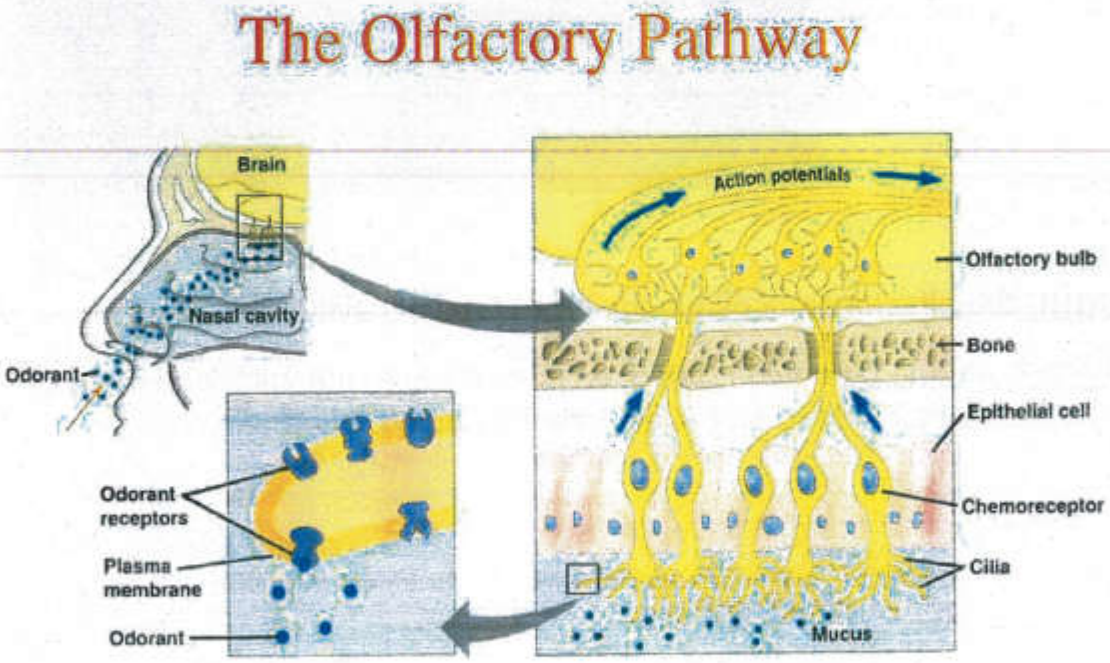
Origin: the olfactory mucosa in the roof of nasal cavity.

Course: about 20 nerve fil (bundles) pass through the cribriform plate of ethmoid on either side to end in the olfactory bulb of the brain.

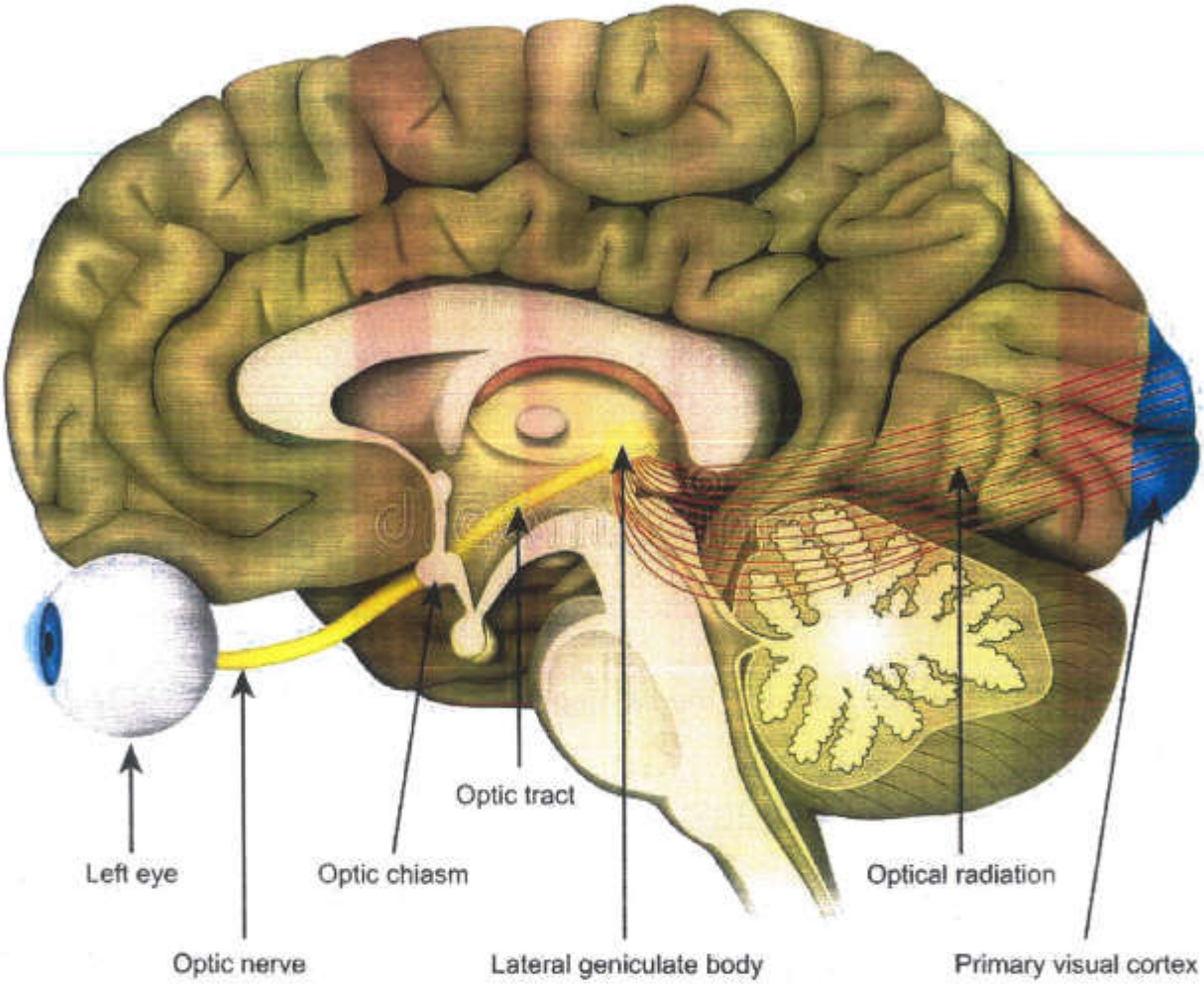
Olfactory pathway

the olfactory nerve is only one component of the overall pathway and is, in fact, made up of multiple nerve fibers/rootlets coming from the receptors cells. The pathway can be summarized as follows:

- olfactory receptor cells
- olfactory nerves
- olfactory bulb
- olfactory tract
- olfactory striae
- olfactory cortex
- output targets of the olfactory cortex



2.) OPTIC NERVE II

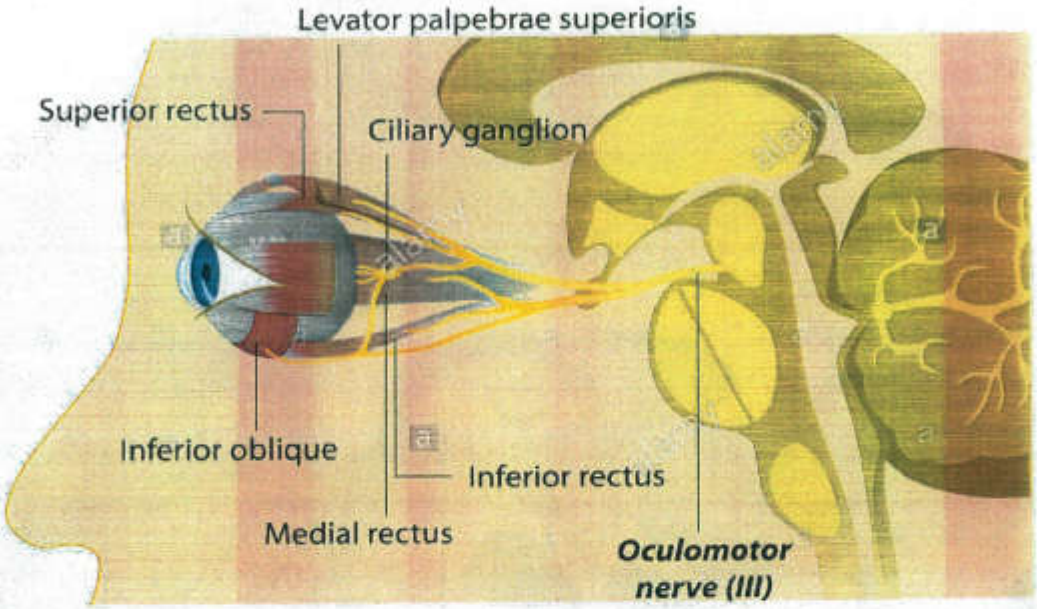


Origin: its fibers are the axons of the ganglion cells of retina

Course and relations:

1- It turns backwards and medially following a slightly sinuous course(to allow free movements of the eye ball)
2- Its crossed from lateral to medial by the nasociliary nerve and ophthalmic artery
3- It passes inside the tendinous ring then leaves the orbit through the optic canal (with the ophthalmic artery below it)
4- It terminates in the cranial cavity by joining the optic chiasma

3.) OCULOMOTOR NERVE III



Origin: arises from the medial aspect of the cerebral peduncle of midbrain.

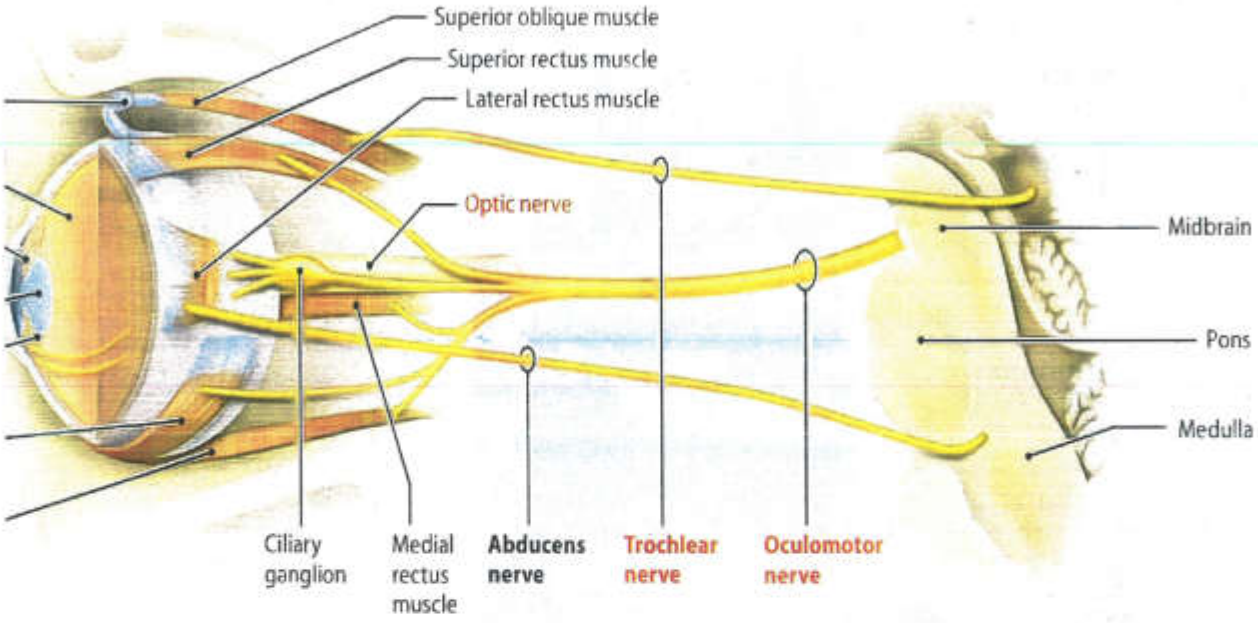
Course and Relations:

1- It pierces the dura mater in front of the point of decussation of the tentorium
2- It passes forwards in the lateral wall of cavernous sinus above the trochlear nerve.
3- Then it enters the orbit through the superior orbital fissure (inside the tendinous ring) where it divides into superior and inferior divisions :

A) The superior division supplies:
   1- Superior rectus
   2- Levator palpebrae superioris
   3- Sympathetic fibers to Muller's

B) The inferior division supplies:
   1- Inferior rectus
   2- Inferior oblique
   3- Medial rectus

4.) TROCHLEAR NERVE IV

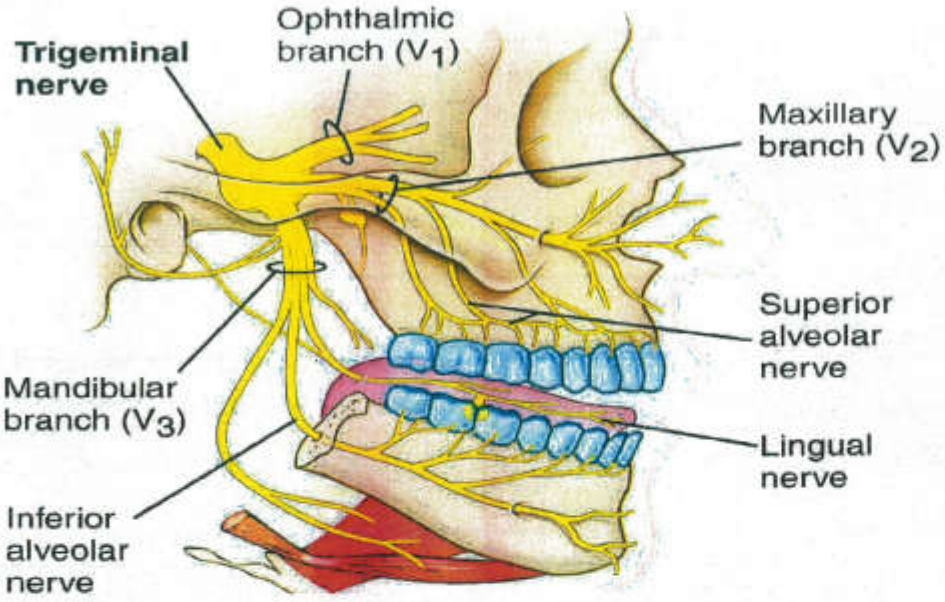


Origin: arises from the posterior aspect of midbrain below the inferior colliculus

Course:

1- It turns forwards around the midbrain
2- It pierces the dura mater at the point of decussation of the tentorium
3- It passes forwards in the lateral wall of cavernous sinus
4- Finally in enters the orbit through the superior orbital fissure outside the tendinous ring
5- Terminates by entering the upper border of superior oblique muscle supplying it.

5.) TRIGEMINAL NERVE V



Type: Mixed "motor and sensory".

Origin: it arises by large sensory root and small motor root, which are attached to the lateral surface of the pons.

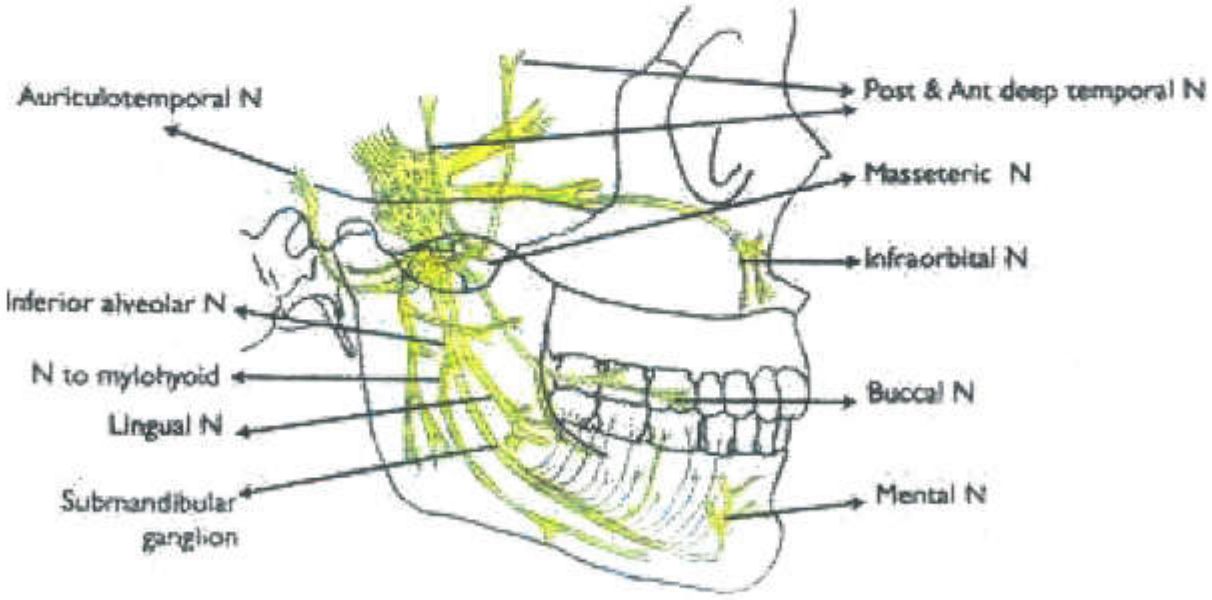
- The sensory root formed by central processes of bipolar cells, which reach the mesencephalon, main sensory spinal nuclei.
- The sensory root of trigeminal nerve synapse in the trigeminal ganglia and the motor root which arise from motor nucleus of trigeminal nerve join with the mandibular nerve in the foramen orali

Branches of the Trigeminal Nerve:

Ophthalmic Nerve gives:	Maxillary Nerve gives:
1. Meningeal Branch 2. Lacrimal Nerve 3. Frontal Nerve 4. Nasociliary Nerve	1. Meningeal Branch 2. Ganglionic Branch 3. Zygomatic Branch 4. Posterior Superior Alveolar Nerve 5. Middle Superior Alveolar Nerve 6. Anterior Superior Alveolar Nerve 7. Terminal Branch in face: palpebral, nasal, labial 8. Mandibular Nerve

MANDIBULAR NERVE:

- **Branch of the main trunk.**
  - Nerve to Sinosus "sensory"
  - Nerve to medial Pterygoid "motor"
- **Branch of the Anterior Division:**
  - Messderic Nerve
  - Nerve to Lateral Pterygoid "motor"
  - 2 Deep Terminal Nerves "motor"
  - Buccal Nerve "sensory"
- **Branches from the Posterior Division:**
  - Auriculotemporal Nerve "sensory"
  - Lingual Nerve "sensory"
  - Inferior Alveolar Nerve "mixed nerve"
  - Nerve to Mylohyoid "motor"

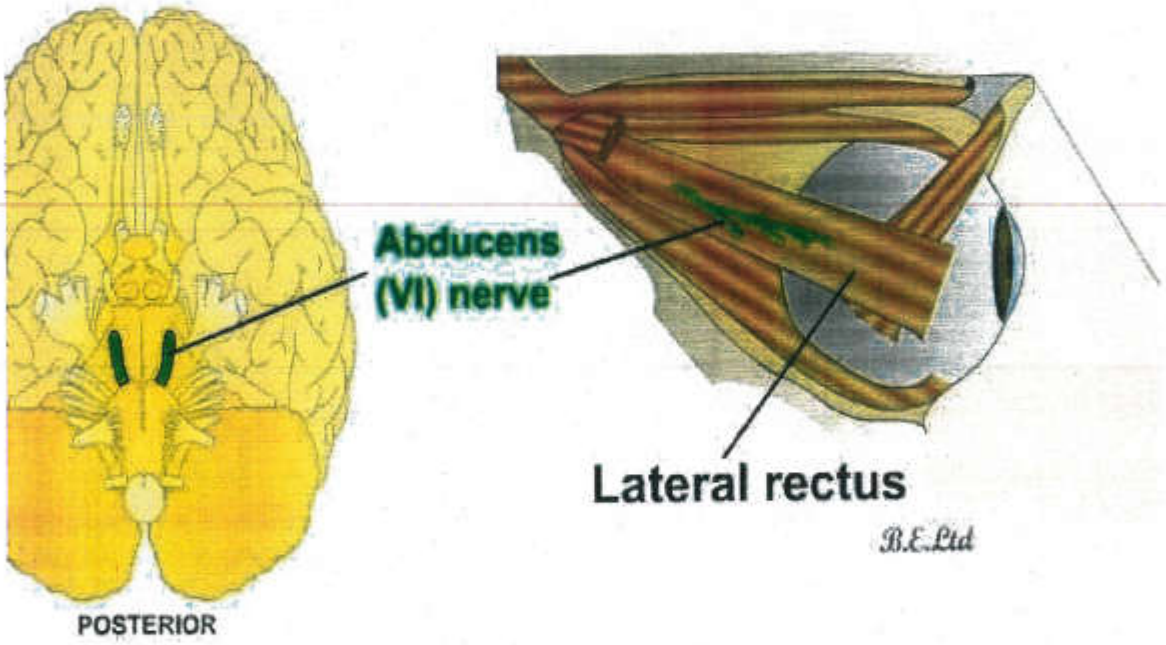


6.) ABDUCENS NERVE VI:

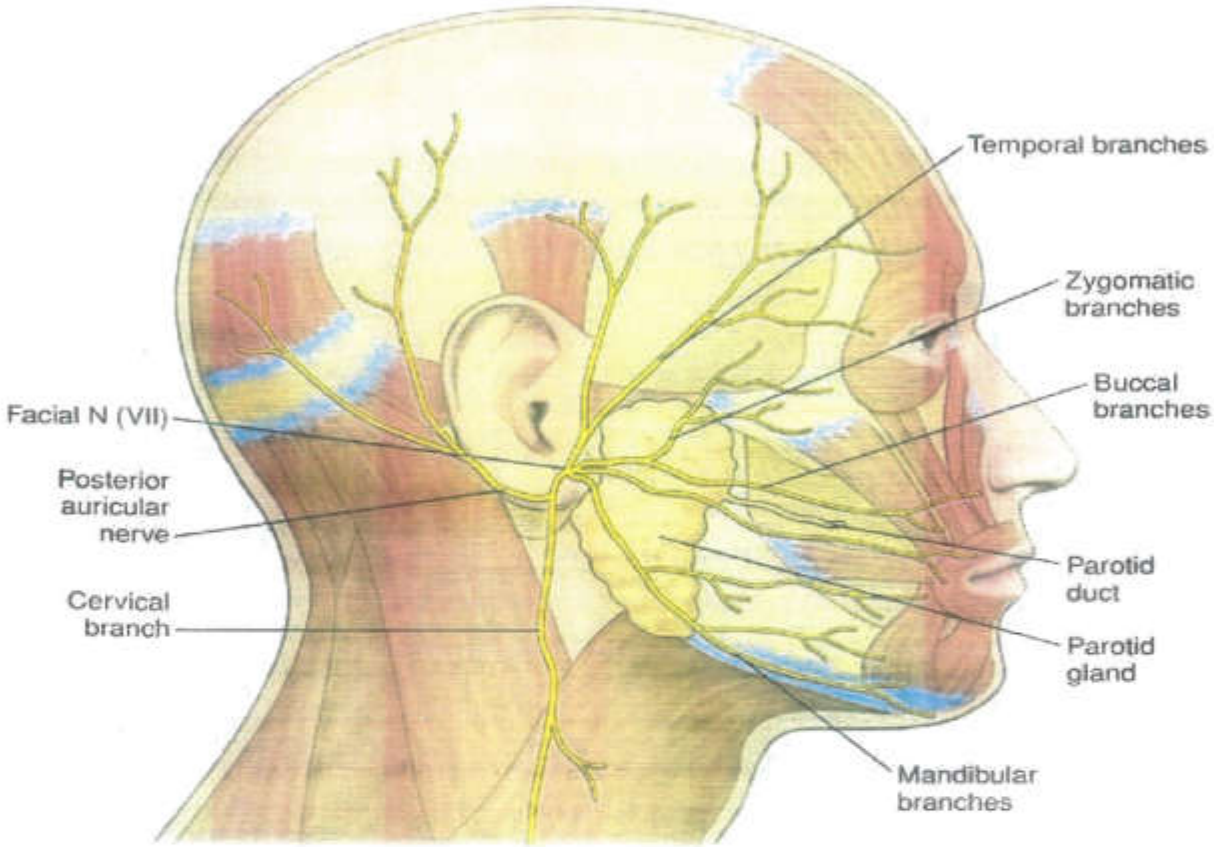
Origin: from the lower border of the pons

Course and relations:

1- It ascends on the clivus then pierces the dura lateral to the dorsum sellae
2- It enters the cavernous sinus traversing its cavity infero-lateral to the I.C.A
3- Then it enters the orbit through the superior orbital fissure (inside the tendinous ring)



7.) FACIAL NERVE VII



Type: it is a mixed nerve containing motor, sensory, and parasympathetic fibers.

Origin: at the lower border of pons, it is formed of 2 parts:

- Facial Nerve proper—arising from the facial motor nucleus.
- Nervus intermedius:
  - Parasympathetic fibers arising from the superior salivary nucleus.
  - _____ fibers arising from solitary nucleus.

Intracranial Course of Facial Nerve:

- It leaves the cranial cavity by exiting the internal "auditory" meatus then runs in the facial canal to reach the stylomutoid foramen.

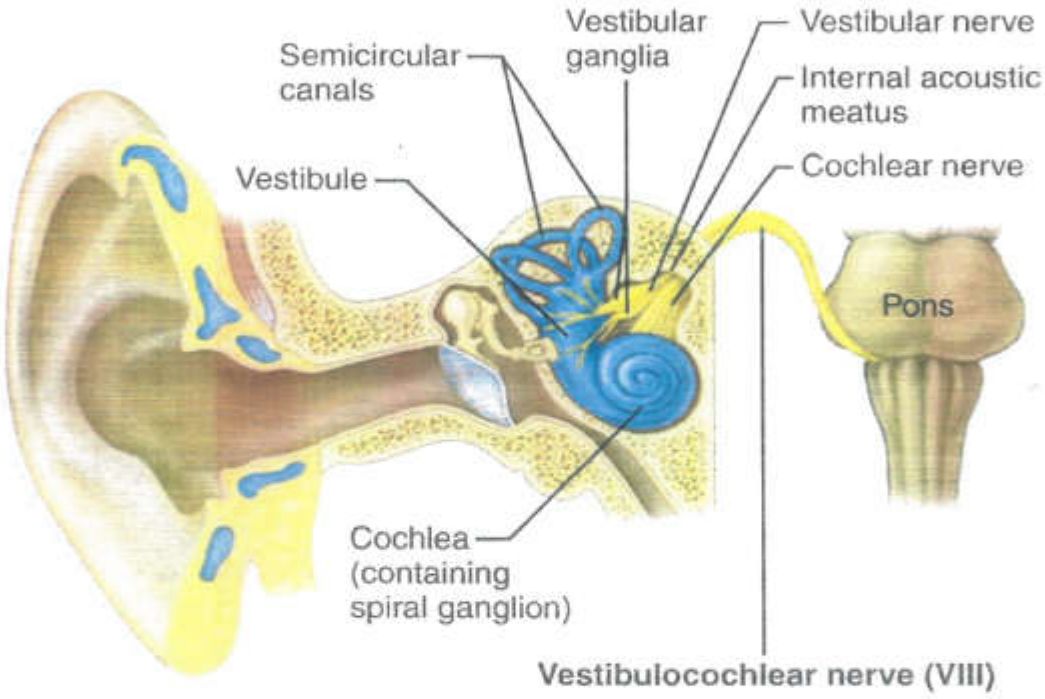
Extra-cranial Course:

- It enters the stylomastoid foramen ten curves around the lateral side of the base of styloid process, then it enters the posteromedial surface of the parotid gland where it ends by dividing into 5 terminal branches.

Branches of Facial Nerve:

Branches of the Intrapetrous Part	Branch of the Extracranial Part
1.) Greater Superficial Petrosal Nerve 2.) Nerve to Stapedius 3.) Nerve to Chorda Tympani	**A. Branch before entering the Parotid Gland:** 1. Nerve to Posterior Bell of Digastric Muscle 2. Posterior Auricular Nerve **B. Branch after entering the Parotid Gland** 1. Temporal branch of Facial Nerve 2. Zygomatic branch of Facial Nerve 3. Buccal branch of Facial Nerve 4. Mandibular branch of Facial Nerve 5. Cervical branch of Facial Nerve

8.) VESTIBULO-COCHLEAR NERVE VIII

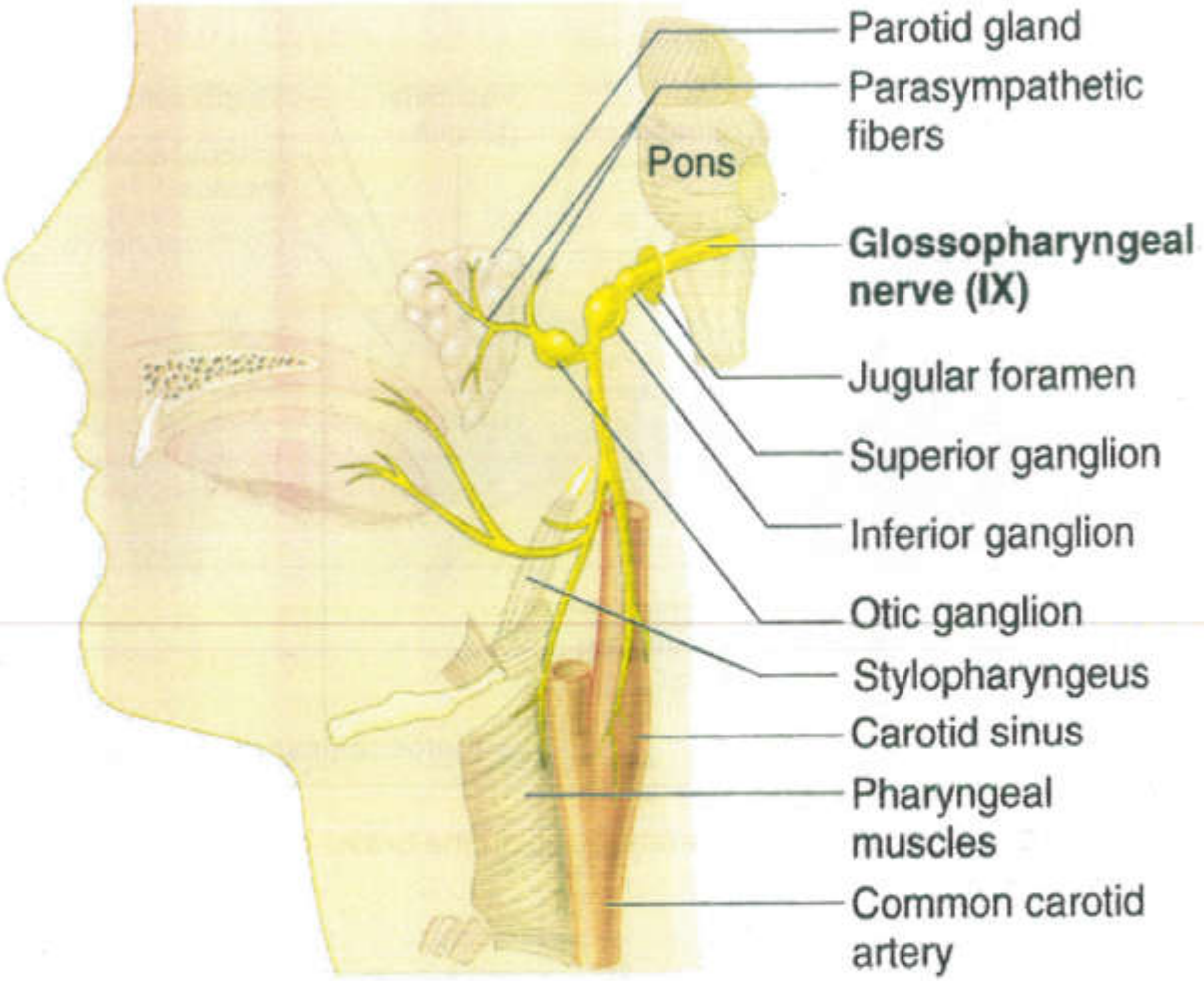


Origin: it originate from different nuclei in the brain

Course:

- It enters the internal auditory meatus (with facial n.) where
- The cochlear part ends in the cochlea
- The vestibular part in the utricle, saccule, the 3 semicircular canal.

9.) GLOSSO-PHARYNGEAL NERVE IX



Origin: it originates in the medulla oblongata it emerges from the anterior aspect of the medulla.

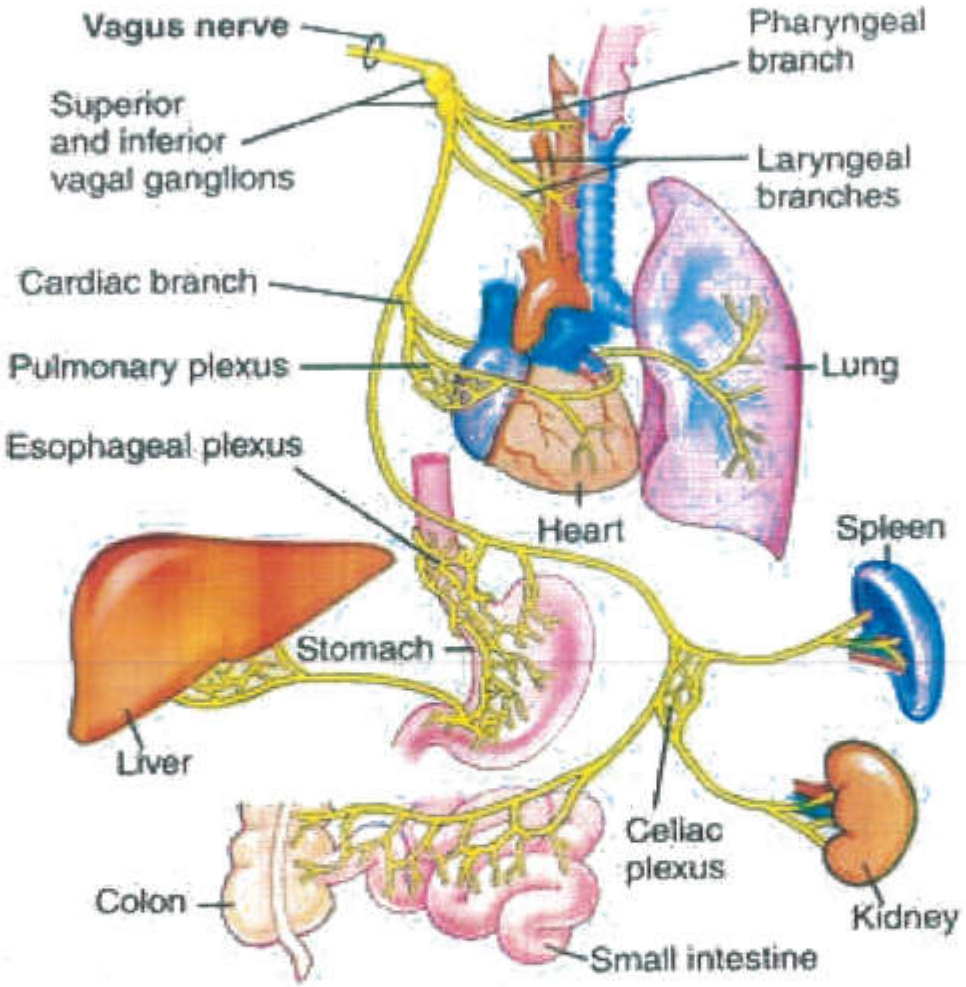
Course and Relations of Glossopharyngeal Nerve:

1- It leaves the cranial cavity through the middle compartment of jugular foramen
2- It descends downwards between I.G.V and I.C.A (in the upper part of carotid sheath) lying deep to the styloid process and muscles attached to it
3- Then it leaves the carotid sheath and passes forwards with stylopharyngeus muscle between the I.C.A and the E.C.A
4- Then it disappears deep to the posterior border of hyoglossus muscle (in the gap between the superior and middle constrictor muscle) and ascends deep to hyoglossus to reach the tongue.
5- It terminates by dividing into terminal branches supplying the mucous membrane of pharynx, tonsil and posterior1/3 of tongue.

Branches:

1- Meningeal branch
2- Carotid branch
3- Nerve to stylopharyngeus muscle
4- Pharyngeal branches
5- Tonsillar branch
6- Terminal lingual branches
7- Tympanic br (Jacobson's nerve)

10.) VAGUS NERVE X



Nucleus: consists of four nuclei located in the medulla oblongata. The three main nuclei are:

1- Dorsal motor nucleus of the vagus nerve
2- Nucleus ambiguus
3- Solitary nucleus
4- Spinal trigeminal nucleus

Origin: from postero-lateral sulcus of medulla.

Course and Relations of Vagus Nerve:

1- It leaves the cranial cavity through the middle compartment of the jugular f. here it has 2 sensory ganglia: superior ganglion and inferior ganglion.
2- The cranial root of the accessory nerve joins the inferior ganglion of vagus just below the jugular f.
3- The vagus descends vertically downwards inside the carotid sheath:
   - First between I.J.V and I.C.A till the upper border of thyroid cartilage
   - Then it descends between the I.J.V and C.C.A
4- At the root of the neck, the vagus nerve crosses Infront of first part of subclavian artery to enter the thorax

Branches:

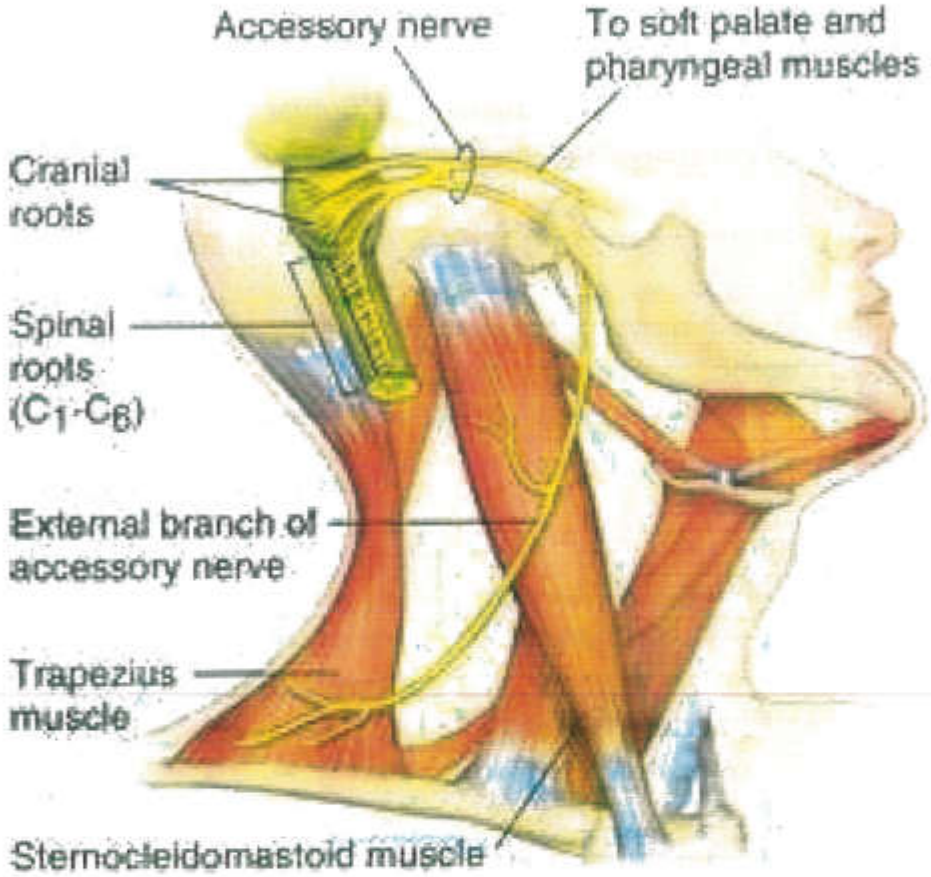
1.) 2 branches arise from the superior ganglion :
   - Meningeal branch
   - Auricular branch

2.) 2 branches arise from the inferior ganglion:
   - Pharyngeal branch
   - Superior laryngeal nerve

3.) 2 cardiac branches :
   - Superior parasympathetic
   - Inferior parasympathetic

4.) Recurrent laryngeal nerve :
   - Rt. Recurrent laryngeal nerve
   - Lt. Recurrent laryngeal nerve

11.) ACCESSORY NERVE XI



Origin: it arises by 2 roots:

1- Cranial root : arises from the posterolateral sulcus of medulla
2- Spinal root : arises from the upper 5 or 6 cervical segments of the spinal cord

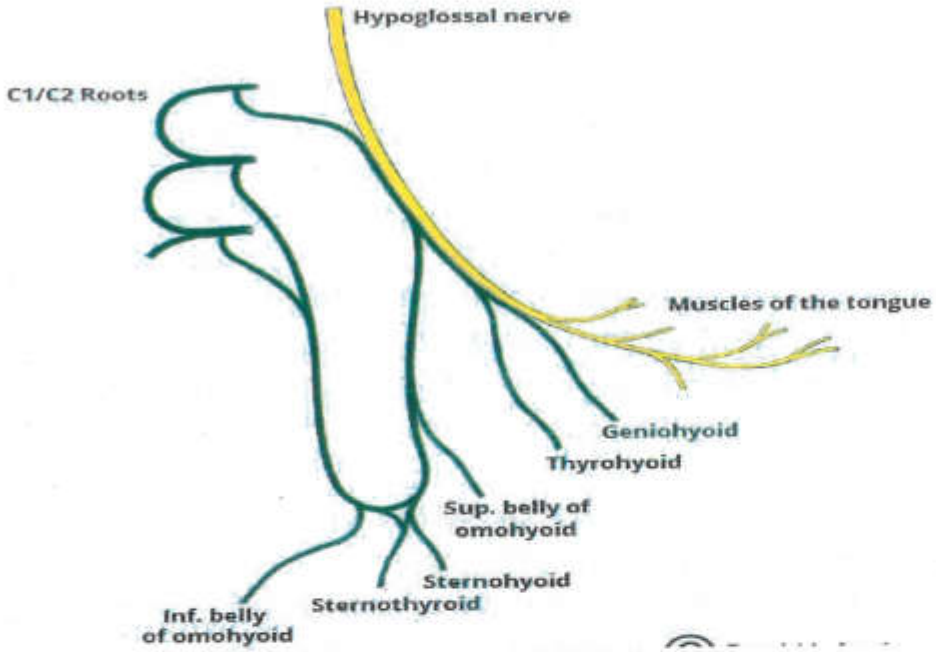
Course and Relations:

1- The spinal root ascends through the foramen magnum to join the cranial root inside the cranial cavity
2- The "united" accessory nerve then leaves the cranial cavity through the middle compartment of the jugular foramen
3- Just below the jugular foramen the 2 roots of the accessory nerve separate from each other
4- The cranial root : joins the inferior Ganglion of vagus nerve and is distributed with its pharyngeal and laryngeal branches
5- The spinal root : has the following course in the neck
    - It descends inside the upper part of the carotid sheath deep to styloid apparatus and between the I.J.V. and the I.C.A
    - Then it passes backwards between the I.J.V. and post. Belly of digastric muscle
    - It pierces the deep surface of sternomastoid muscle
    - It crosses the posterior triangle in the neck
    - Finally it pierces the anterior border of trapezius muscle (above clavicle by 5 cm) and ends supplying it.

Branches:

1- The cranial accessory nerve :
   a) Pharyngeal branch
   b) Laryngeal branches
2- The spinal accessory nerve

12.) HYPOGLOSSAL NERVE XII



Origin: it arises from the hypoglossal nucleus in the medulla oblongata

Course and relations:

1- It leaves the cranial cavity through the anterior condylar foramen
2- Then it descends vertically downwards inside the upper part of carotid sheath superficial to vagus n. between I.I.V and I.C.A
3- It descends deep to styloid process, stylohyoid muscle and posterior belly of digastric muscle.
4- It turns forwards crossing I.C.A , occipital a. , E.C.A, loop of lingual a.
5- It disappears deep to the intermediate tendon of digastric muscle to reach the submandibular region where it runs on hyoglossus muscle.
6- It disappears deep to mylohyoid m. below lingual n. and the submandibular duct.
7- Finally it dips in the interval between the hyoglossus and the genioglossus where it breaks into terminal branches supplying the muscle of the tongue.

Branches:

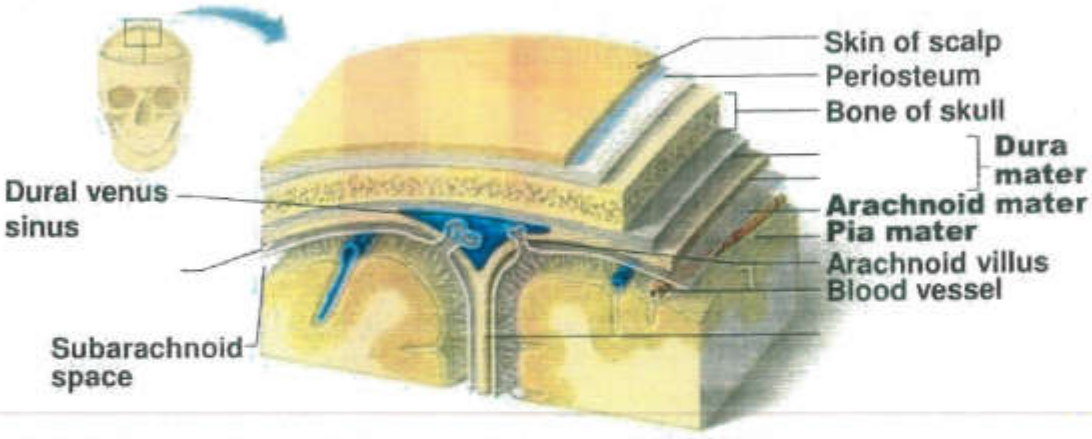
1- Branches arising from hypoglossal nerve itself :

a) Nerve to styloglossus muscle
b) Nerve to hyoglossus muscle
c) Nerve to genioglossus muscle
d) Nerve to all intrinsic muscle of the tongue

2- Branches derived from C1 joining hypoglossal nerve:

a) Meningeal branch to dura matter
b) Nerve to geniohyoid muscle
c) Nerve to thyrohyoid muscle
d) Supplying Infrahyoid muscle

Meninges



- **Definition:** they are the 3 membranes that cover the brain and spinal cord.
- **Layers:**
  - Dura Mater
  - Arachnoid Mater
  - Pia Mater

1. Dura Mater:

- It's the outermost membrane.
  - **Consists of 2 layers:**
    - Outer layer
    - Inner (meningeal) layer—villi process
- The outer and inner layers are adherent to each other except where the dural folds and venous sinuses are present.

- **The Distal infillings:**
    - The meningeal layer folds up to form dural in-foldings that divide the cranial cavity into different compartments:
        - Falx Cerebri—found in the cerebral fissure, which divides the 2 hemispheres of the cerebrum.
        - Tentorium Cerebelli—separates the cerebellar lobes of cerebrum from the cerebellum.
        - Falx Cerebelli—separates the cerebellar hemispheres.
        - Diaphragma Sella—forms a roof over the pituitary gland.

Note: The Dural infoldings form spaces between the 2 layers of the dura mater. These spaces are called "Dural Venous Sinuses."

2. Arachnoid Mater

- Definition: It's given the name arachnoid for its delicate, spider-web-like filaments that extend form it's under surface through the cerebrospinal fluid to pia mater.
    - Where it contains blood vessels and nerve plexuses
- **Shape:** spider web like appearance.
    - **Subarachnoid space:** it's the anatomic space between the arachnoid mater and pia mater.
- **Importance:** it contains the cerebrospinal fluid (C.S.F.)

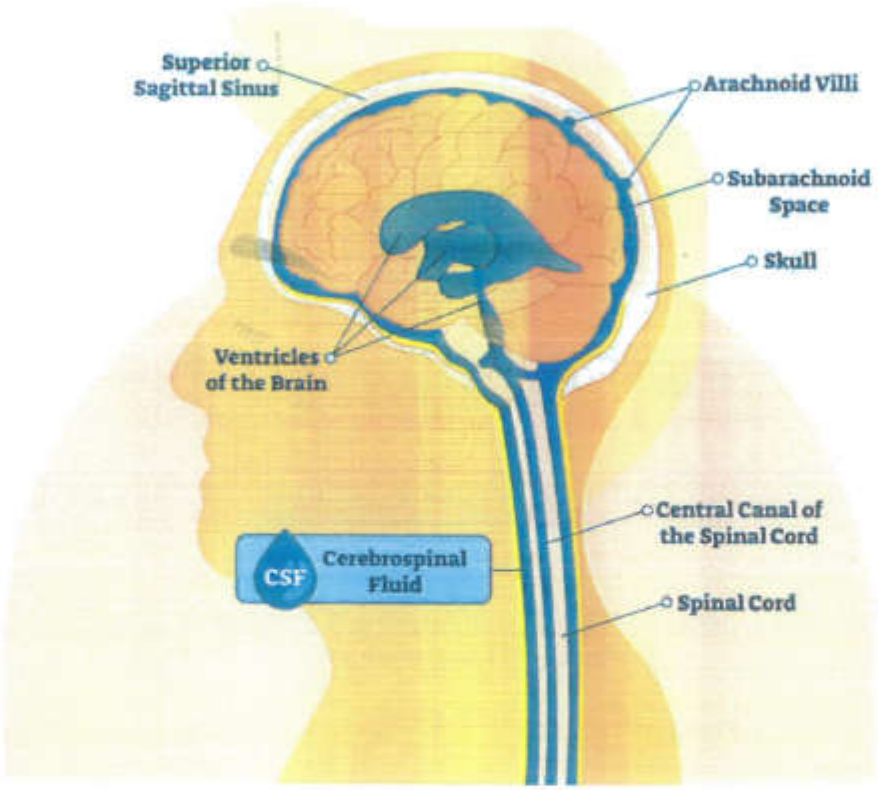
3. Pia Mater:

- **Definition:** It's the inner membrane which firmly adheres to the surface of the brain and spinal cord. It's pierced by blood vessels to the brain and spinal cord, and it's capillaries nourish the brain.

Clinical Importance:

- Subdural and Subarachnoid hematoma (hemorrhage) are usually caused by trauma such as a head injury.

Cerebrospinal Fluid (C.S.F.)



- **Definition:** it's a watery fluid, that's continuously produced by choroid plexuses and absorbed by the villi arachnoid projecting to the dura mater to the venous sinuses.
- **Site:** it's situated in the ventricles around the brain and spinal cord (in subarachnoid space)
- Cerebral Spinal Fluid: 150-c.c.

Secretion : the CSF is secreted by choroid plexus on the walls of different ventricles of brain

two lateral ventricles : 70 to 75 %

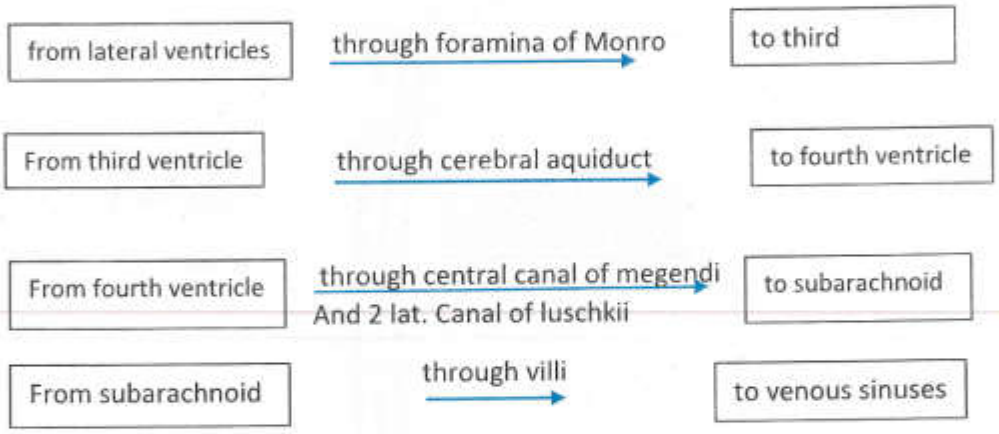
third ventricle :20 to 25 %

fourth ventricle : 5 to10 %

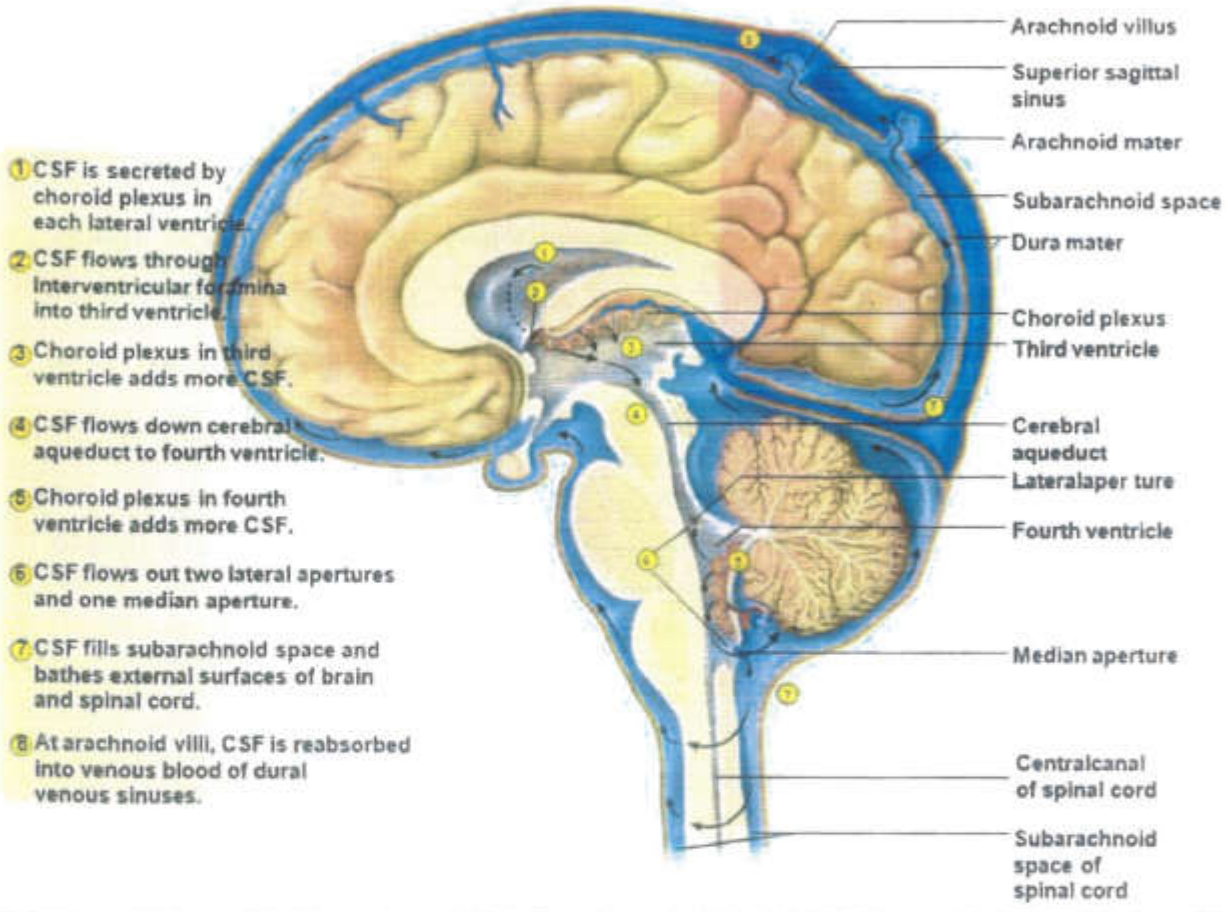
normal CSF in the human body is 150 CC

daily CSF circulation is around 5000 CC.

Circulation :



Flow of Cerebrospinal Fluid


1 CSF is secreted by choroid plexus in each lateral ventricle.
2 CSF flows through interventricular foramina into third ventricle.
3 Choroid plexus in third ventricle adds more CSF.
4 CSF flows down cerebral aqueduct to fourth ventricle.
5 Choroid plexus in fourth ventricle adds more CSF.
6 CSF flows out two lateral apertures and one median aperture.
7 CSF fills subarachnoid space and bathes external surfaces of brain and spinal cord.
8 At arachnoid villi, CSF is reabsorbed into venous blood of dural venous sinuses.
Arachnoid villus
Superior sagittal sinus
Arachnoid mater
Subarachnoid space
Dura mater
Choroid plexus
Third ventricle
Cerebral aqueduct
Lateralaper ture
Fourth ventricle
Median aperture
Centralcanal of spinal cord
Subarachnoid space of spinal cord

- **Functions of the Cerebrospinal Fluid:**
  - Autoimmune system of the Central Nervous system (C.N.S.), because there is no lymph in the C.N.S.
  - Protection and waste product transfer.
  - Pathway of infectious transmission.
- **Clinical Importance:**
  - Impairment of Cerebrospinal Fluid secretion and absorption may cause:
    - **Hydrocephalus**
      - In infants, most obvious sign is abnormally large head.
      - In older kids and adults there's no head enlargement, but symptoms may include vomiting, sleepiness, imbalance, and blurred vision due to intracranial hypertension.

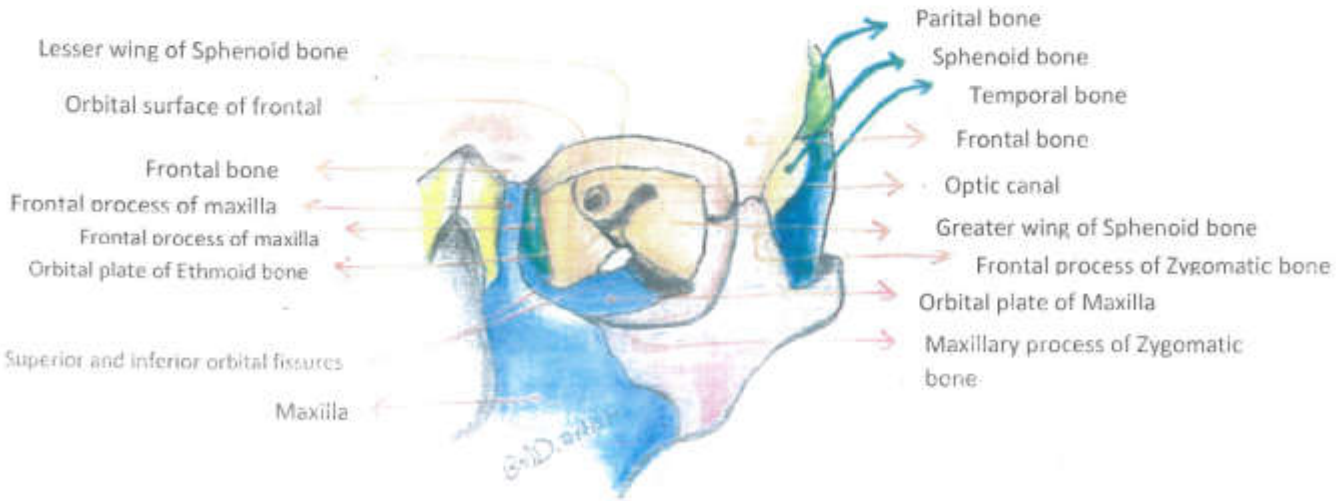
THE ORBIT

Definition:-

A pyramidal, bony cavity located in the facial skeletal. With its base anteriorly – opening of the Orbit-, and its apex posteriorly –optic canal-.

Boundaries of bony Orbit

1. The base: - the opening of the orbit, has four margins:-
   1. Upper margin: - the floor of frontal bone.
   2. Lower margin: - Medially: - Maxillary bone, laterally: - Zygomatic bone.
   3. Medial margin: - Above frontal bone, below: - Maxillary bone.
   4. Lateral margin: - frontal process of zygomatic bone.
2. The Apex: - At the Optic canal.
3. The Walls: - 1. Medial wall: - Frontal process of Maxillary bone – Lacrimal bone – -Orbital plate of Ethmoid bone.
   2. Lateral wall: - frontal process of Zygomatic bone – greater wing of Sphenoid bone
4. The Roof orbital plate of Frontal bone and lesser wing of Sphenoid bone.
5. The Floor orbital surface of Maxilla and maxillary process of Zygomatic bone.



Bony Orbit ...

Contents of Orbit

1. Eye ball 2. Muscles of eyeball 3. lacrimal apparatus.
4. Vessels. 5. Nerves. 6. Orbital ligaments, fascia and fat.

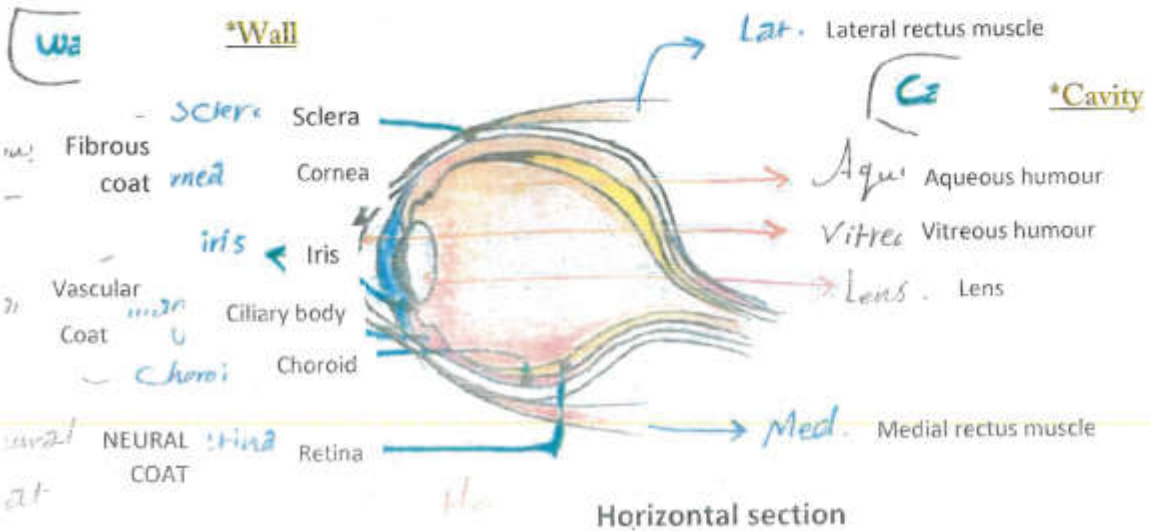
FIRST: - EYE BALL

I. WALL OF EYEBALL * has three coats*

1. Outer (fibrous coat)
   - Cornea: is the anterior transverse part of fibrous coat, it is avascular.
   - Sclera: it is a white, hard, smooth and glistening.
2. Middle (vascular coat)
   - Choroid
   - Cillary body
   - Iris
3. Inner (neural coat): *Retina*

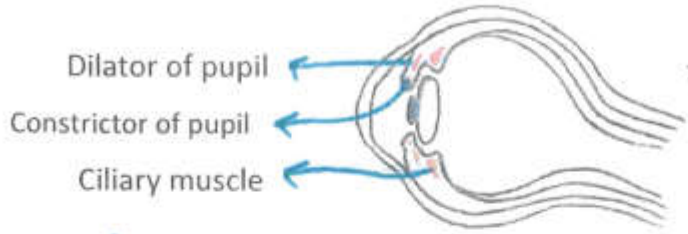
II. CAVITY OF EYEBALL

1. Aqueous humour: a clear fluid filing the space between the cornea and lens–ant. & post. Chambers.
2. Vitreous humour (body): is a colorless substance, filing the space behind lens.
3. Th e lens: is a biconvex transparent structure, lies between aqueous and vitreous humours.



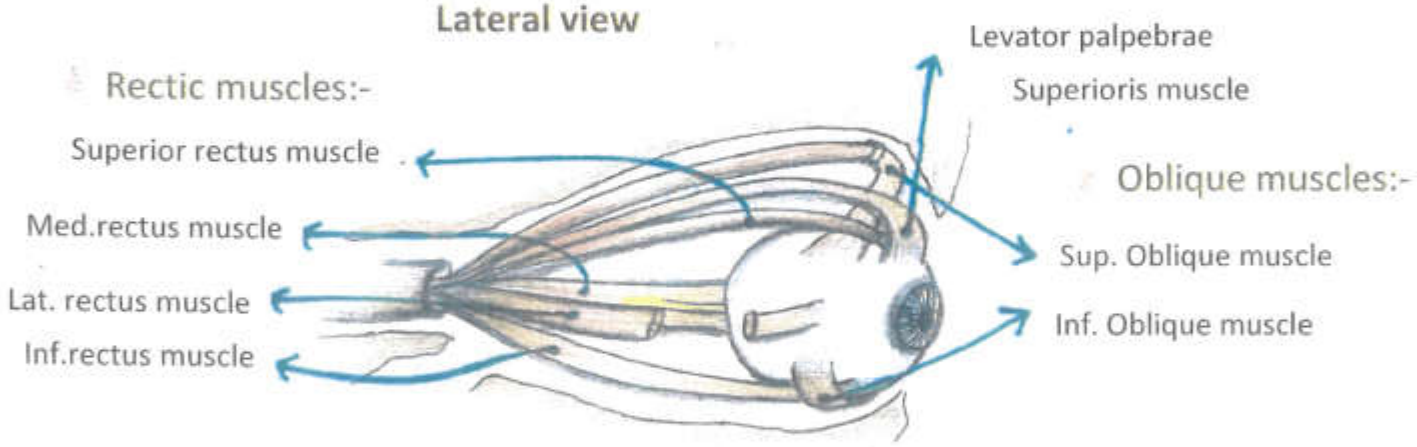
Horizontal section

-INTRINSIC AND EXTNINSIC MUSCLES:-



⁂ **Intrinsic muscle**
(Horizontal section)

⁂ **Extrinsic muscles**
Lateral view



-NERVE SUPPLY OF ORBITAL MUSCLE

** Muscles of eyeball **

All of the extrinsic muscles are supplied by divisions of the Occulomotor Nerve, EXCEPT the lateral rectus muscle, which is supplied by the ABDUCENT nerve (6th C. N), and the superior oblique which is supplied by the Trochlear nerve (4th C. N).

SECOND:- MUSCLES OF THE ORBIT

** Muscles of eyeball **

1. Intrinsic muscles: ** Smooth muscles **

- *Constrictor of the pupil* —Action→ *constricts pupil*
- *Dilator of the pupil* → *Dilates pupil*
- *Ciliary* → *control the shape of lens*

2. Extrinsic muscles: **extra-Occular* muscle*

- *Levator palpebrae superioris LPS.*
- *Four Rectic muscles* (sup, inf, med, lat)
- *Two oblique muscles* (sup, inf)

	Muscle	Origin	Insertion	Action
	LPS	Under surface of lesser wing of sphenoid bone.	Torsal plate and skin of sup. Eyelid.	Elevates the superior (upper) eyelid.
	Superior rectus muscle	**All are inated from tendinous ring on posterior wall of orbital cavity**	Superior surface of eyeball.	Directs comea upward and medially
	Inferior rectus muscle		Inferior surface of eyeball.	Directs cornea downward , medially
	Medial rectus muscle		Medial surface of eyeball	Rotates cornea to looks medially
	Lateral rectus muscle		Lateral surface of eyeball	Rotates cornea to looks laterally
	Superior oblique muscle	posterior wall of orbital cavity.	To superior surface of eyeball	Direct cornea downward and laterally.
	Inferior oblique muscle	Floor of orbital cavity	Lateral surface of eyeball	Direct cornea upward and laterally.

Third: - Lacrimal apparatus.

- Lacrimal gland and its duct
- Conjunctival sac
- Lacrimal sac, canaliculi, puncti

*Lacrimal gland:
- **Main** part: - lies the lacrimal fossa, anterolateral part of orbital roof.
- **Palpebral part:** - embedded in lateral Part of upper eyelid

*Lacrimal duct: 12 ducts open into the superior fornix of conjunctiva.

*Conjunctiral sac: a membrane that lies the eyelids and reflected to cover the anterior part of eyeball except the cornea.

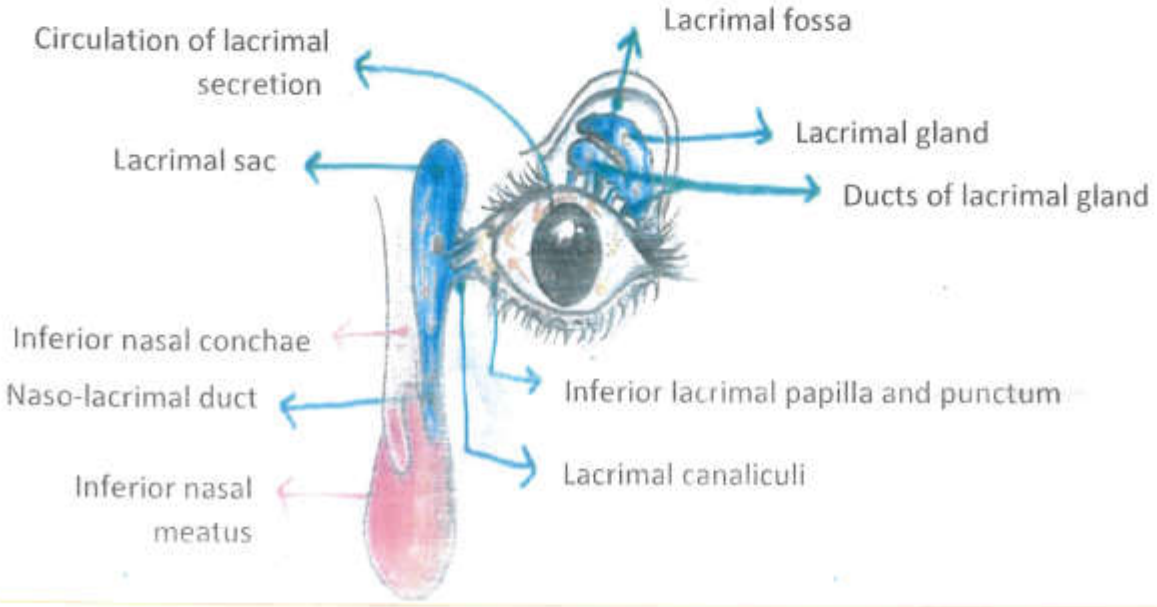
*Puncti

Two openings present in the medial ends of the margin of upper and lower eyelids. They lead to two Canaliculi.

*Canaliculi: opening from the puncti to the lacrimal sac.

*Lacrrimal sac: lies in the lacrimal groove, upper to nasolacrimal duct.

*Nasolacrimal duct: arises from lacrimal sac and passes through the nasolacrimal canal to reach the inferior meatus of nose.



Fourth: Vessels of orbit :-

1.ophthalmic artery

2.superior ophthalmic vein and inferior ophthalmic vein.

Fifth: Nerve of the orbit:-

1. *Special sensory nerve*: Optic nerve
2. *General sensory nerve*: Ophthalmic nerve.
3. *Motor nerve*: Occulomotor, Trochlear, and Abducent nerve.
4. *Autonomic nerve*: sympathetic, parasympathetic, and ciliary ganglion.

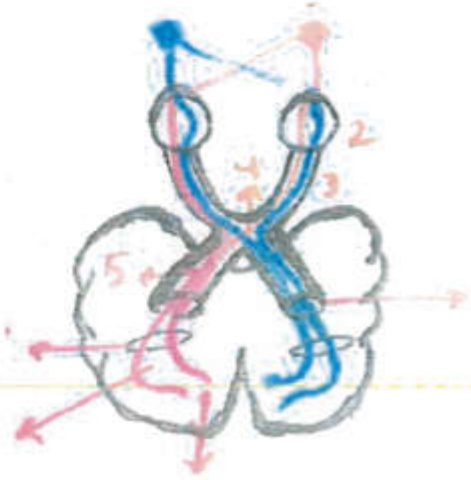
Sixth: Orbital ligaments, fascia, and fat.

Visual pathway

The optic nerve is made up of two type –medial and lateral fibers- those fibers cross up in the optic chiasm 4

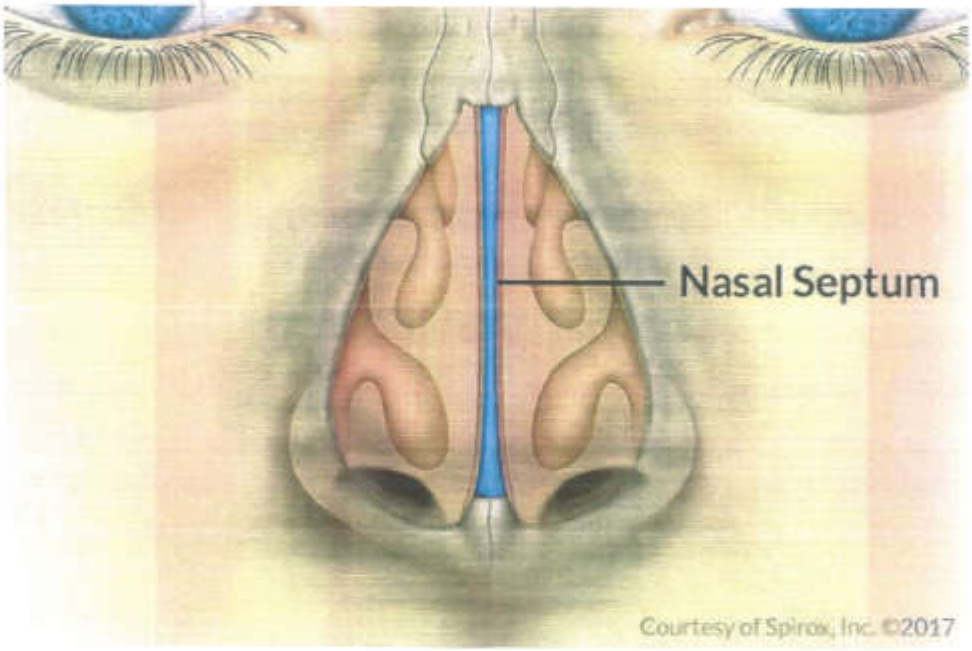
The pathway of visual is as following:-

1. visual field → 2. Retina → 3. Optic nerve → 4. Optic chiasm → 5. Optic tract → 6. Medial meniscus → 7. Lateral geniculate body → 8. Optic radiation → 9. to occipital lobe (visual area)



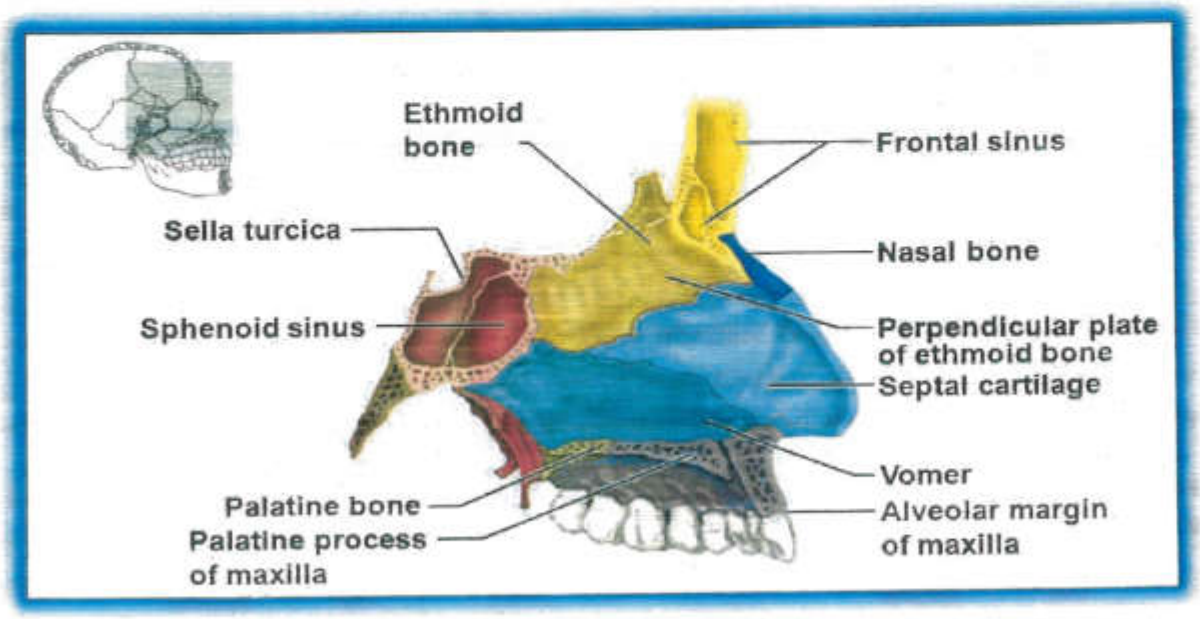
Nasal Cavity

- **Definition:** The nasal cavity is a large, air-filled space above and behind the nose in the middle of the face.
    - It divided into two cavities right and left nasal septum. You can see that in this picture :

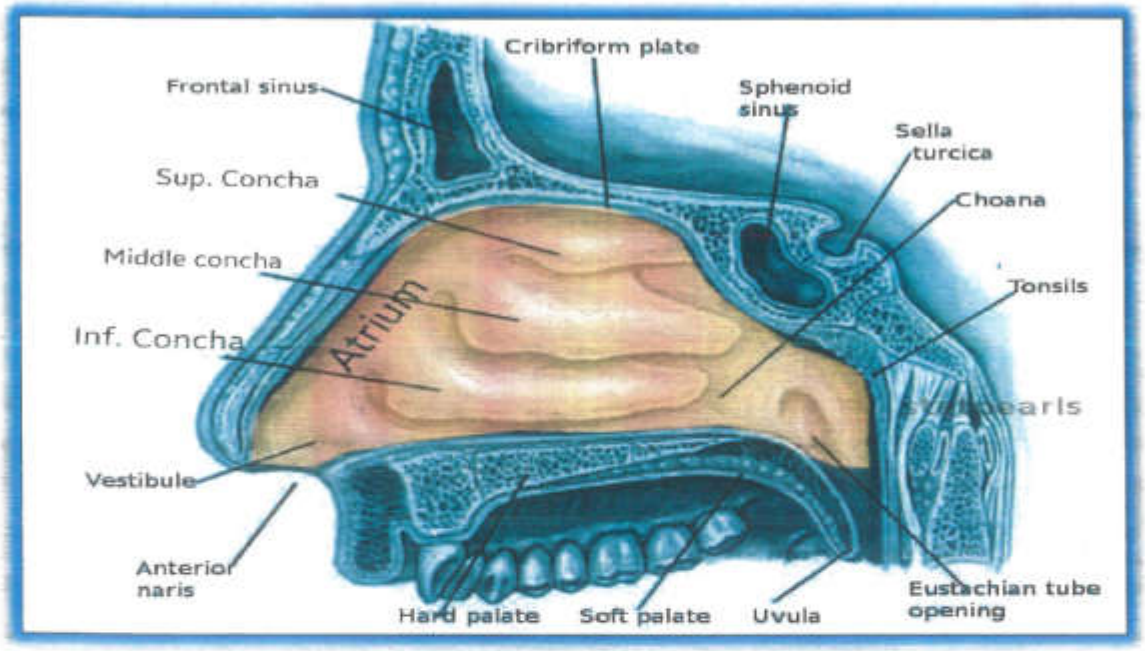


- **Function:**
    - It has a role in:
        - Respiration because it warms the air and passes it from the nostrils to the nasopharynx and the rest of the respiratory tract.
        - Voice
        - Smell by its sensory receptors like Olfactory Nerve.

- **Boundaries:**
  - **The Roof:**
    - Anterior sloping part= nasal bone
    - Middle horizontal part= cribriform plate of ethmoid bone.
    - Posterior sloping part= body of sphenoid bone.
  - **The Floor:**
    - Hard Palate (the palatine processes of maxillae)
  - **Medial Wall:**
    - Anteriorly—Septal cartilage
    - Posterosuperior—Perpendicular plate of ethmoid bone.
    - Inferosuperior—Vomer bone.
  - **Lateral Wall:**
    - Nasal Surface of the Maxilla
    - Perpendicular plate of the Palatine Bone
    - Labyrinth of the Ethmoid Bone
    - Lacrimal Bone
    - Medial Plate of Pterygoid Process
    - Inferior Nasal Concha.
  - Anterior Wall:
    - Nasal Bone
    - Pair of Anterior Nasal Apertures
  - Posterior Wall:
    - Body of Sphenoid
    - Pair of Posterior Nasal Apertures

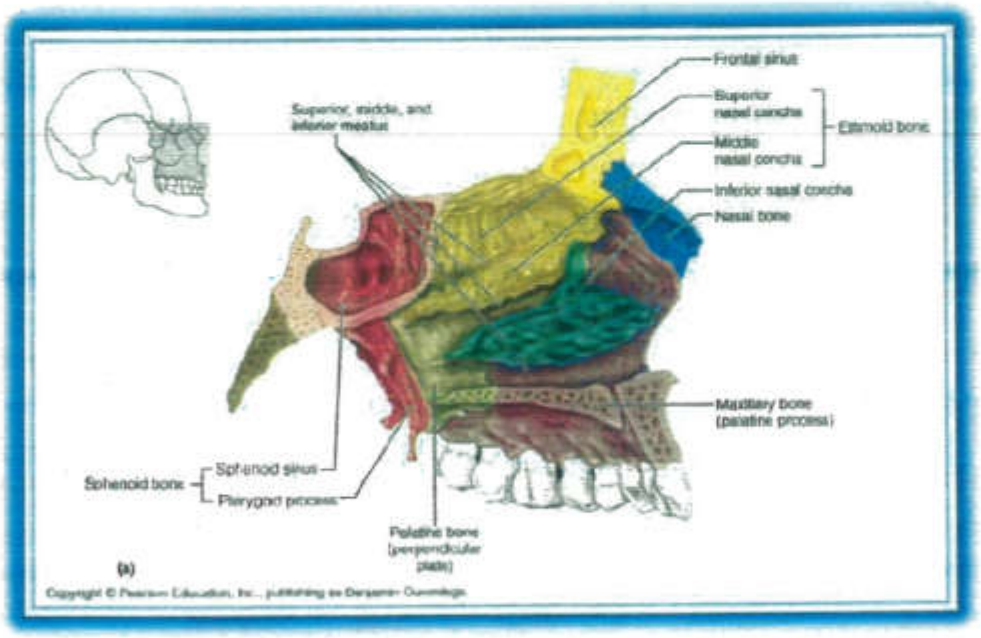


- **Note:**
  - The Medial Wall of the nasal cavity corresponds to the nasal septum, which separates the cavity into two symmetrical parts. The bony nasal septum is formed by the vomer and the perpendicular plate of the ethmoid.

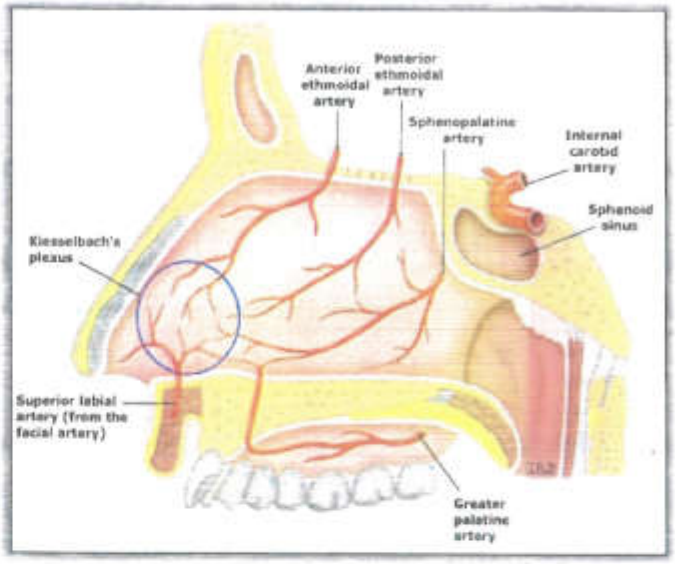


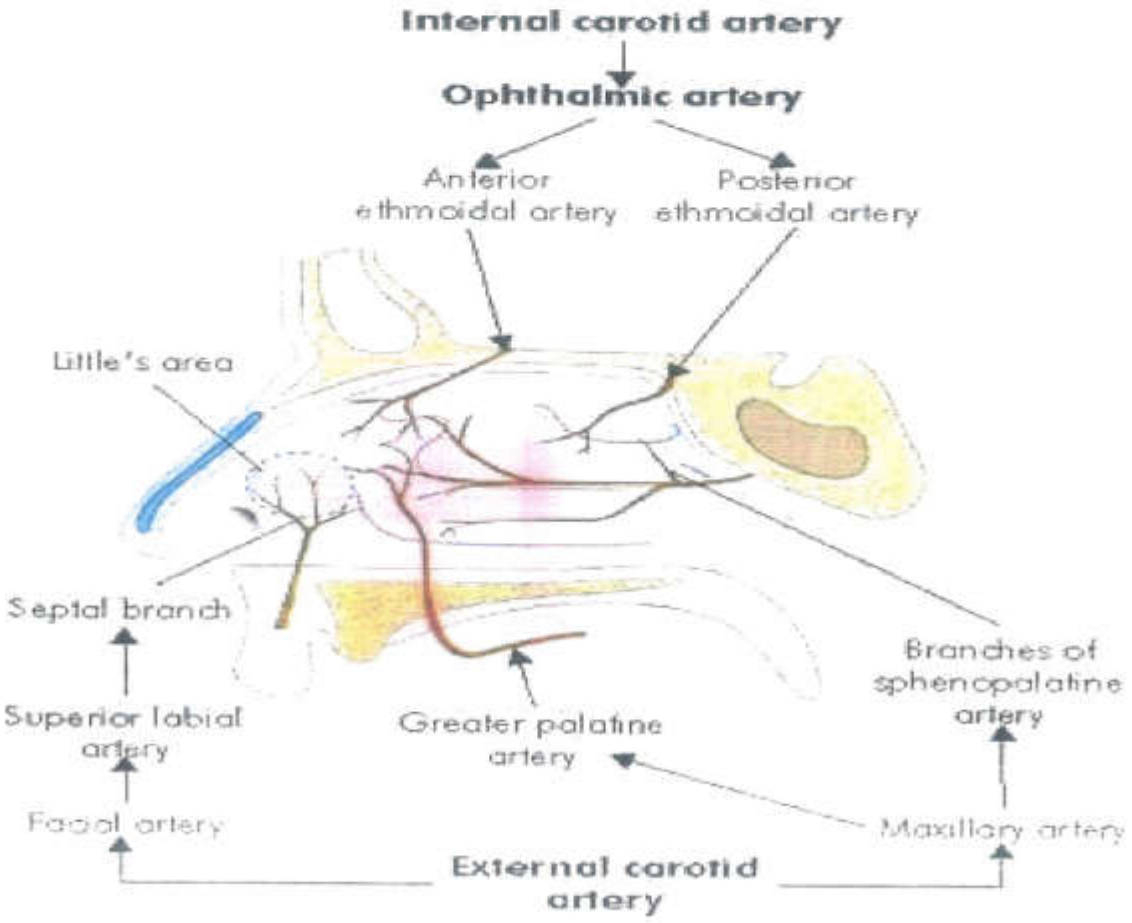
- **Nasal Conchae:**
  - The Nasal Conchae are three shelf like elevation that divide the nasal cavity into four spaces "meatuses".
    1.) Superior Nasal Concha:
      - It's the smallest.
      - Is a part of the ethmoid bone
    2.) Middle Nasal Concha:
      - Medium sized
      - Also a part of the ethmoid bone
    3.) Inferior Nasal Concha
      - The largest of the three.
      - It's a separate bone

- **Meatuses of Nasal Cavity:**
  - Meatuses are spaces below nasal conchae which are:
    1.) **Spheno-Ethmoidal Recess:**
        - Is above the Superior Nasal Concha, it receives the opening of the Sphenoidal air sinuses.
    2.) **Superior Meatus:**
        - Is below the Superior Nasal Concha, it receives the opening of the posterior Ethmoidal air sinus.
    3.) **Middle Meatus:**
        - It is below the middle Nasal Concha, and has the following features—
            - Bulla Ethmodalis—receives the opening of the middle Ethmoidal air sinus.
            - Hiatus Semilunaris—receives the opening of
                1. Frontal Air Sinuses
                2. Maxillary Air Sinuses
                3. Anterior Ethmoidal Air Sinuses
    4.) **Inferior Meatus:**
        - Is below the inferior Nasal Concha, it receives the opening of the Naso-Lacrimal Duct.



- **Arterial Supply of Nasal Cavity:**
  - **Branches of the Ophthalmic Artery:**
    - Anterior Ethmoidal Branch
    - Posterior Ethmoidal Branch
  - **Branches of Maxillary Artery:**
    - Sphenopalatine Branch
    - Greater Palatine Branch
  - **Branch of Facial Artery:**
    - Septal Branch of Superior Labial Branch



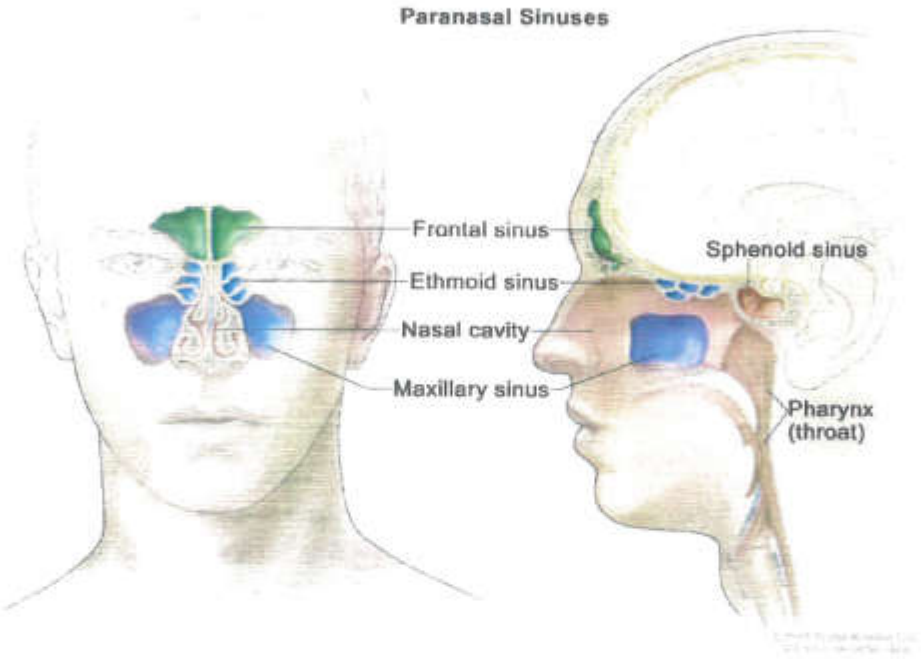


- **Nerve Supply:**

For medial wall	For lateral wall
1.) Olfactory Nerve 2.) Branches of Trigeminal Nerve a.) Anterior Ethmoidal Nerve b.) Short Spheno-Palatine Nerve c.) Long Spheno-Palatine Nerve	1.) Olfactory Nerve 2.) Branches of Trigeminal Nerve a.) Anterior Ethmoidal Nerve b.) Superior Alveolar Nerve c.) Short Spheno-Palatine Nerve d.) Greater Palatine Nerve

- **Lymph Drainage:**
  - **Anterior Part:**
    - Into Submandibular Lymph Nodes
  - **Posterior Part:**
    - Into Retropharyngeal and Upper Deep Lymph Nodes

The Paranasal Sinuses of the Nasal Cavity



- **Definition:** they are air filled spaces inside the skull bones that are connected and all drain into the nasal cavity, they all come in pairs
- **Function:**
  - Warms and humidifies air
  - Mucous Secretion (protection for the brain)
  - Diminishes the sight of the skull
  - Gives resonance to the voice
- **Content**(They come in pairs):
  - The Maxillary Sinuses
  - The Frontal Sinuses
  - The Sphenoid Sinuses
  - The Ethmoidal Sinuses

1.) Maxillary Air Sinuses

- **Definition:** It's an opening that's situated in the medial wall of nasal cavity and it opens into hiatus semilunaris of the middle meatus of the nose.
- **Site:** Whole body of maxilla
- **Shape:** Pyramidal Shape
- **Size:** the largest air sinuses
- **Opening:** into the hiatus semilunaris of the middle nasal meatus.
- **Relation of Maxillary Air Sinuses:**
  - **Base:**
    - Lateral Wall of Nasal Cavity
  - **Apex:**
    - At Zygomatic Process
  - **Roof:**
    - Orbital Plate of Maxilla
  - **Floor:**
    - Alveolar Process of Maxilla
  - **Walls:**
    - Anterior Wall—anterior surface of Maxilla
    - Posterior Wall—posterior surface of Maxilla
- **Nerve Supply:**
  - Infra Orbital Nerve
  - Superior Alveolar Nerve
  - Greater Palatine Nerve

2.) Frontal Sinuses

- **Definition:** are sinuses found behind the supeciliary arch.
- **Open**: into the hiatus semilunaries of middle nasal meatus.

3.) Sphenoid Sinuses

- **Definition:** are inside the body of sphenoid bone.
- **Opens:** into the posterior part of spheno-ethmoidal recess.

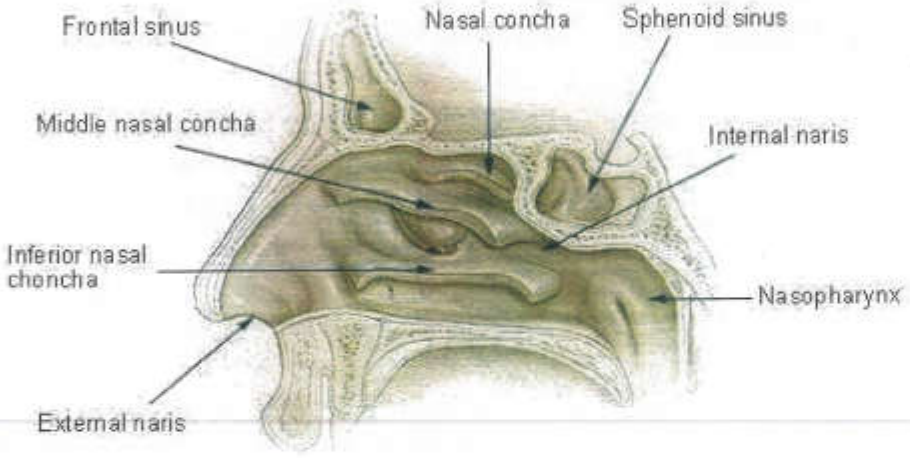
4.) Ethmoidal Sinuses

- **Definition:** they are found inside the Ethmoidal labyrinth.
    - Subdivisions:
        - Anterior Group: opens into middle nasal meatus
        - Middle Group: opens into middle nasal meatus
        - Posterior Group: opens into superior nasal

Nasal Concha

- **Definition:** is a long, narrow, curled shelf of bone that protrudes into the breathing passage of the nose. The Nasal Concha is also called a turbinate.
- **Structure:** Conchae are composed of pseudostratified columnar, ciliated respiratory epithelium with a thick, vascular, and erectile glandular tissue layer.
- **There are 3 Nasal Conchae:**

Nose and Nasal Cavities



1.) Superior Nasal Concha:

The superior conchae are smaller structures, connected to the middle conchae by nerve-endings, and serve to protect the olfactory bulb. The openings to the posterior Ethmoidal sinuses exist under the superior meatus.

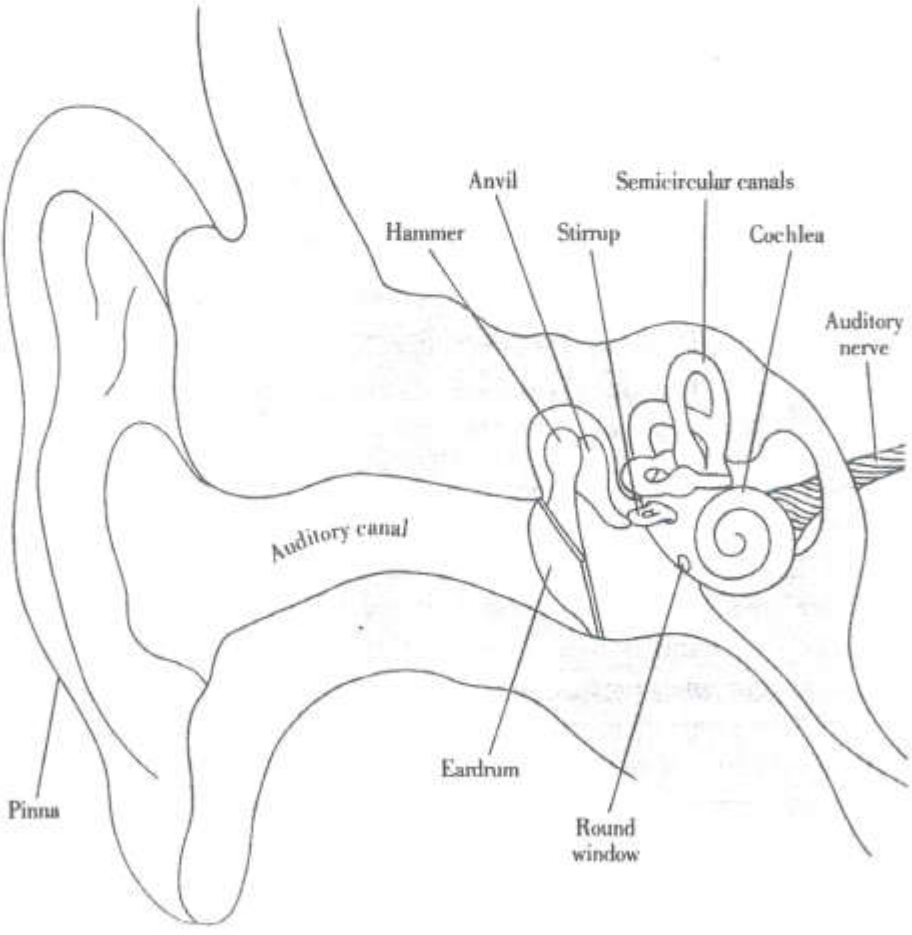
2.) Middle Nasal Concha:

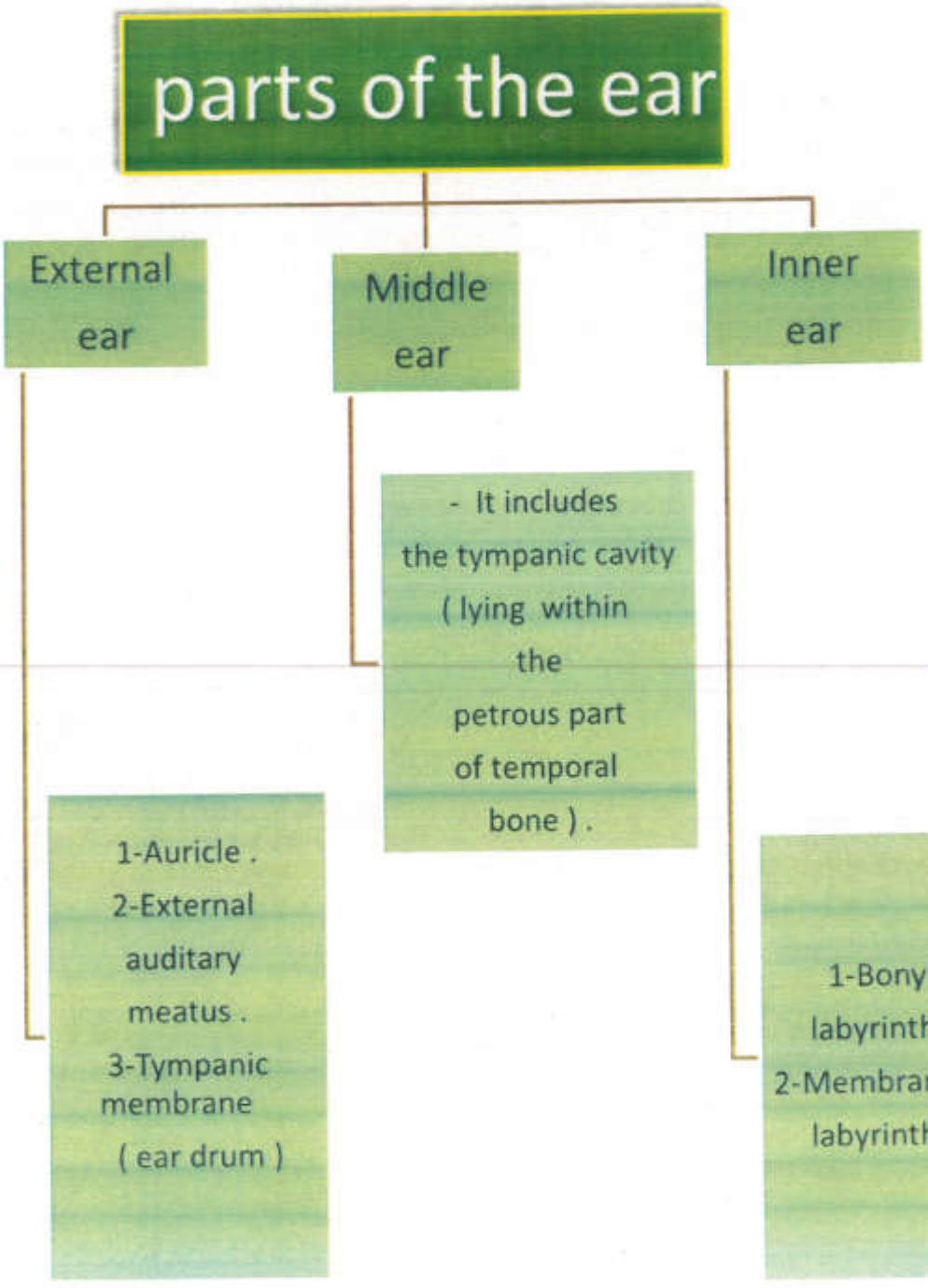
The middle conchae are smaller. In humans, they are usually as long as the little finger. They project downwards over the openings of the maxillary and anterior and middle ethmoid sinuses

3.) Inferior Nasal Concha

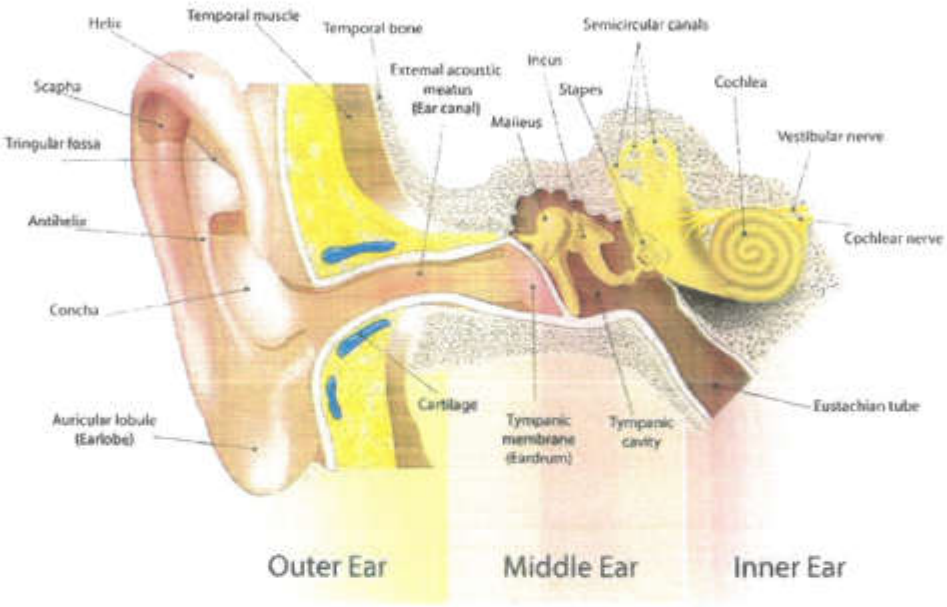
The largest, and can be as long as the index finger in humans, and are responsible for the majority of airflow direction, humidification, heating, and filtering of air inhaled through the nose.

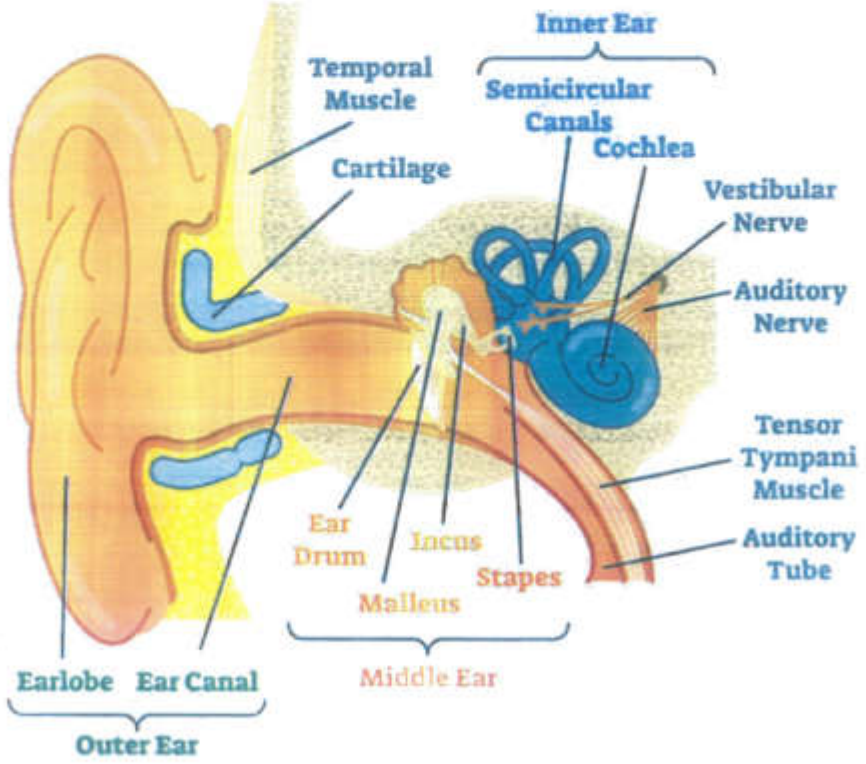
Ear Cavity


Anvil
Semicircular canals
Hammer
Stirrup
Cochlea
Auditory nerve
Auditory canal
Eardrum
Pinna
Round window


parts of the ear
External ear
Middle ear
Inner ear
1-Auricle .
2-External auditary meatus .
3-Tympanic membrane (ear drum)
- It includes the tympanic cavity (lying within the petrous part of temporal bone) .
1-Bony labyrinth .
2-Membranous labyrinth

Anatomy of the Ear





1- EXTERNAL EAR

A- The auricle

Formed of yellow elastic cartilage except its lobule which is devoid of cartilage .

Collects the sound waves .

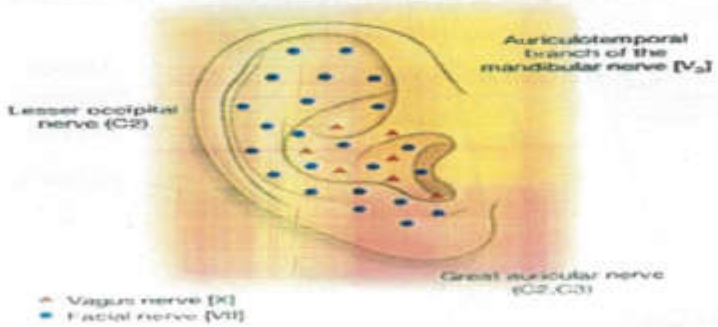
Related to 3 vestigial muscles

1-Ant. auricularis .

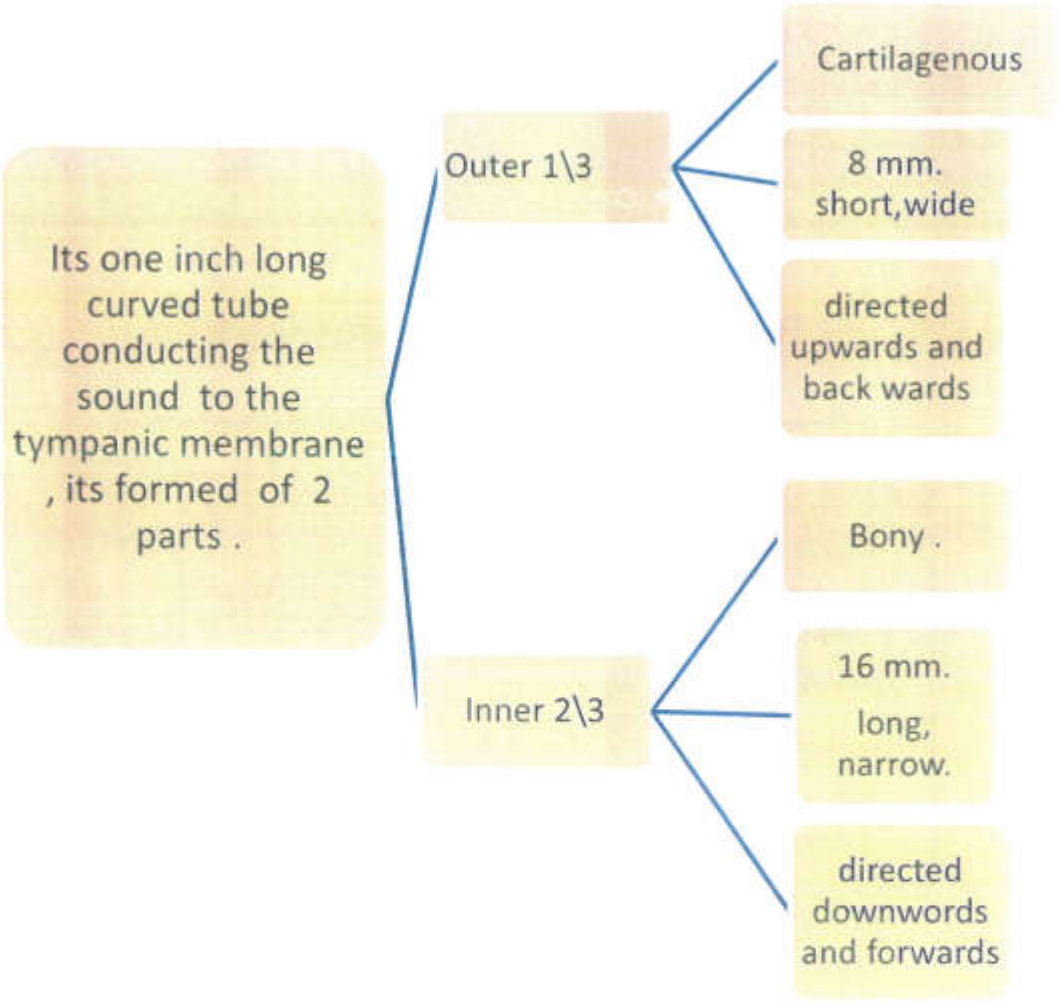
2- Post. auricularis.

3-Sup. auricularis .

Nerve supply	Blood supply	Lymphatic drainage
1-auriculotemporal n. supplies the upper 1\2 of its outer surface. 2-Lesser occipital n. supplies the upper 1\2 of the inner surface . 3-Great auricular n. supplies the lower 1\2 of both outer and inner surfaces . 4- Auricular branch of vagus n. supplies an area on the inner surface . Motor supply (auricular muscles) : facial nerve .	Posterior auricular and superfacial temporal vessels .	Pre-auricular (parotid) , post. Auricular, cervical lymph nodes .


Auriculotemporal branch of the mandibular nerve [V3]
Lesser occipital nerve (C2)
Great auricular nerve (C2,C3)
Vagus nerve [X]
Facial nerve [VII]

B- The external auditory meatus


Its one inch long curved tube conducting the sound to the tympanic membrane , its formed of 2 parts .
Outer 1\3
Cartilagenous
8 mm. short,wide
directed upwards and back wards
Inner 2\3
Bony .
16 mm. long, narrow.
directed downwords and forwards

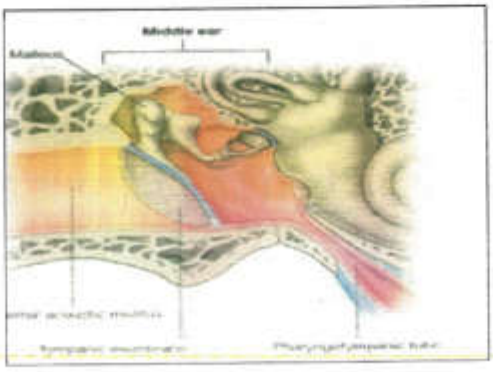
The external auditory meatus is lined by thin skin .

The skin here is rich in sebaceous and waxy gland .

Nerve supply .	Blood supply .	Lymphatic drainage .
Ant. half : auriculotemporal nerve . Post. half auricular branch of vagus nerve .	Outer part : Post. Auricular and superfacial temporal vessels (as auricle) . Inner part : deep auricular branch of the maxillary artery.	Preauricular, Post. Auricular and cervical lymph nodes (as auricle)

c- The tympanic membrane (ear drum)

- Has 2 surfaces.
  - Outer concave: lined by thin skin
  - Inner convex: gives attachment to the handle of malleus
- Size: 10mm x 8mm .
  site: It seprates the external auditory meatus from the middle ear cavity.
- It lies obliquely so the outer surface is directed downwards, forward and laterally
- composed of 3 layers.
  - Outer layer of skin.
  - Middle layer of fibrous.
  - Inner layer of mucous membrane



Nerve supply .	Arterial supply .	Venous drainage.	Lymphatic drainge.
Outer surface : auriculotemporal n. (Ant , Inf) and auricular branch of vagus n. Inner surface : tympanic branch of glossopharyngeal nerve .	Outer surface: deep auricular branch of maxillary artery. Inner surface: Ant and Post. tympanic arteries .	Outer surface: external jugular vein . Inner surface: transverse dural sinus.	Pre-auricular and retropharyngeal lymph nodes .

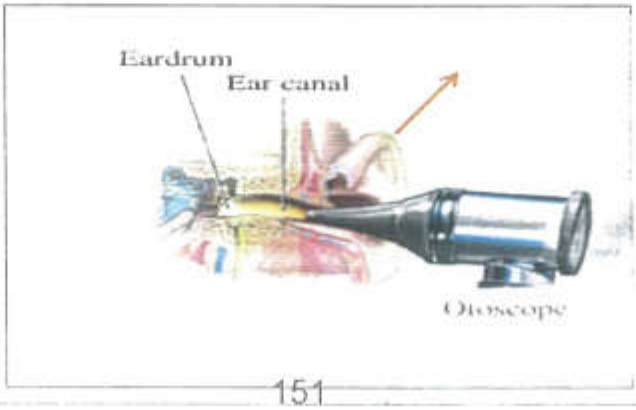
Applied anatomy:

1-The skin of the external auditory meatus is firmly attached to its periosteum, so boils of the meatus cause severe pain .

2-The skin of the external auditory meatus is rich in sebaceous and waxy gland , so impaction of the meatus by wax is common , and sometimes needs ear wash .

3-Ear wash can cause reflex cough due to irritation of the auricular branch of vagus .

4-The external auditory meatus is not straight , so during examination using the otoscope, the auricle should pulled superiorly , posteriorly and slightly lateral (to straighten the meatus and examine the tympanic membrane easily).

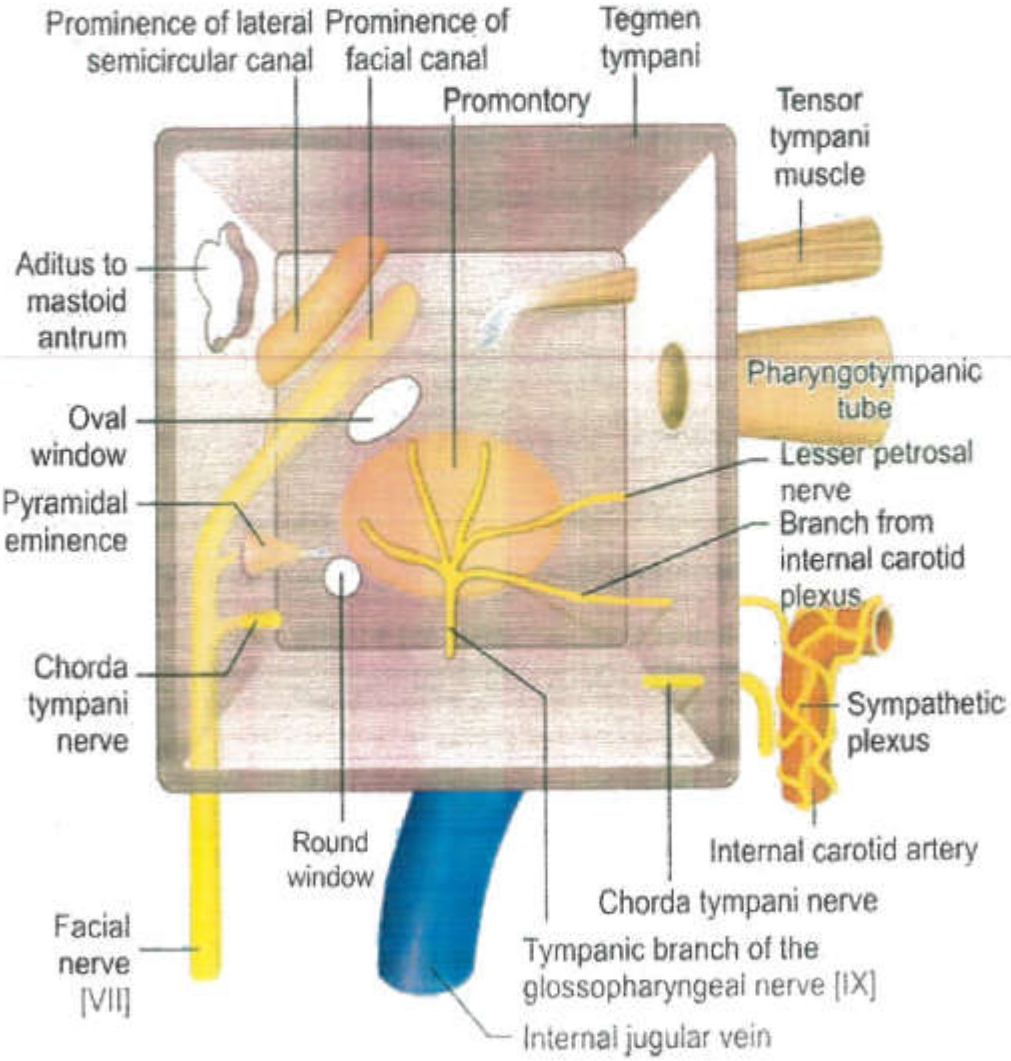


2- The middle ear

Site: inside the petrous part of the temporal bone .

It is the tympanic cavity (air filled cavity and lined with mucous membrane).

Shape: small biconcave box . Its vertical axis is roughly parallel to the plane of the ear drum .

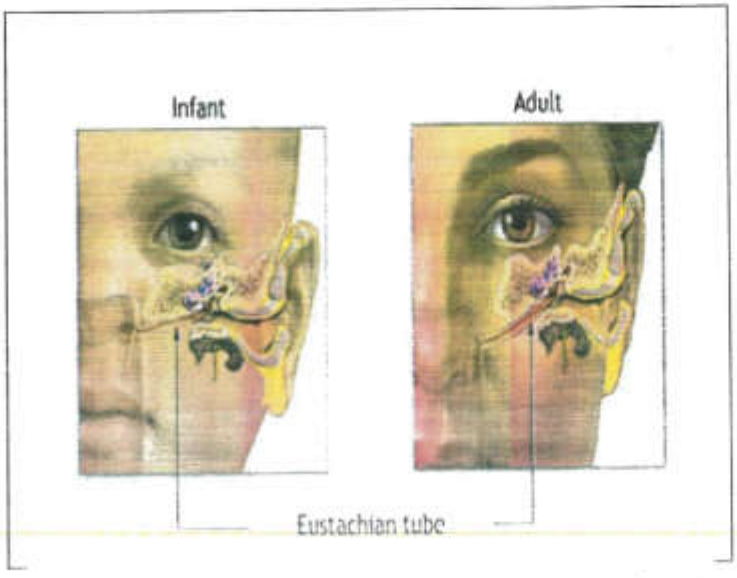


Surfaces of the middle ear

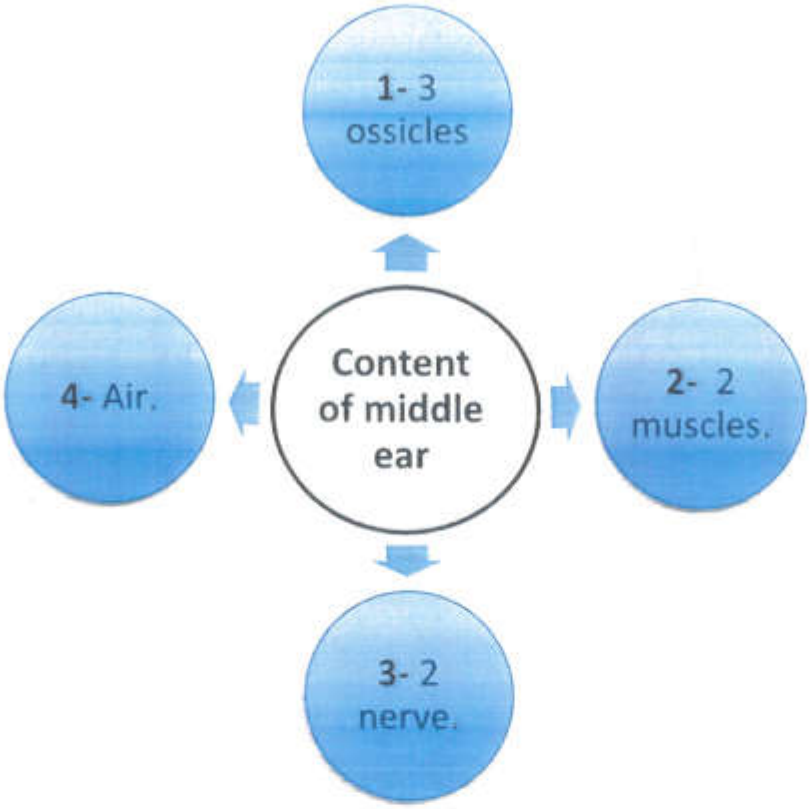
Roof	Thin plate of bone (tegmen tympani)	Its separates the middle ear from the middle cranial fossa containing the temporal lobe of the brain .
Floor	Thin plate of bone	Its closely related to IJV. Infections of middle ear can cause IJV thrombosis .
Anterior wall	Thin plate of bone	Contains 2 openings: one for tensor tympani muscle (superiorly) and for auditory tube (in the middle) . It is separated from carotid canal by bony septum (inferiorly).
Posterior wall	A bony partition separating the middle ear from the mastoid air cells .	It has : 1-Bony projection (pyramid) for origin of stapedius muscle . Opening into the mastoid antrum . 2- Fossa incudes for the short process 3- of incus .
Lateral wall	The tympanic membrane (ear drum)	The epitympanic recess (above the tympanic membrane) contains head of malleus and body of incus .
Medial wall	It separates the middle ear from the inner ear .	It has: 1-Horizontal part of facial canal . 2-Promontory: a projection caused by basal turn of the cochlea. 3-Oval window: above promontory (closed by stapes) 4-Round window: below promontory (closed by 2ry tympanic membrane) 5- Sinus tympani: the depression between both windows.

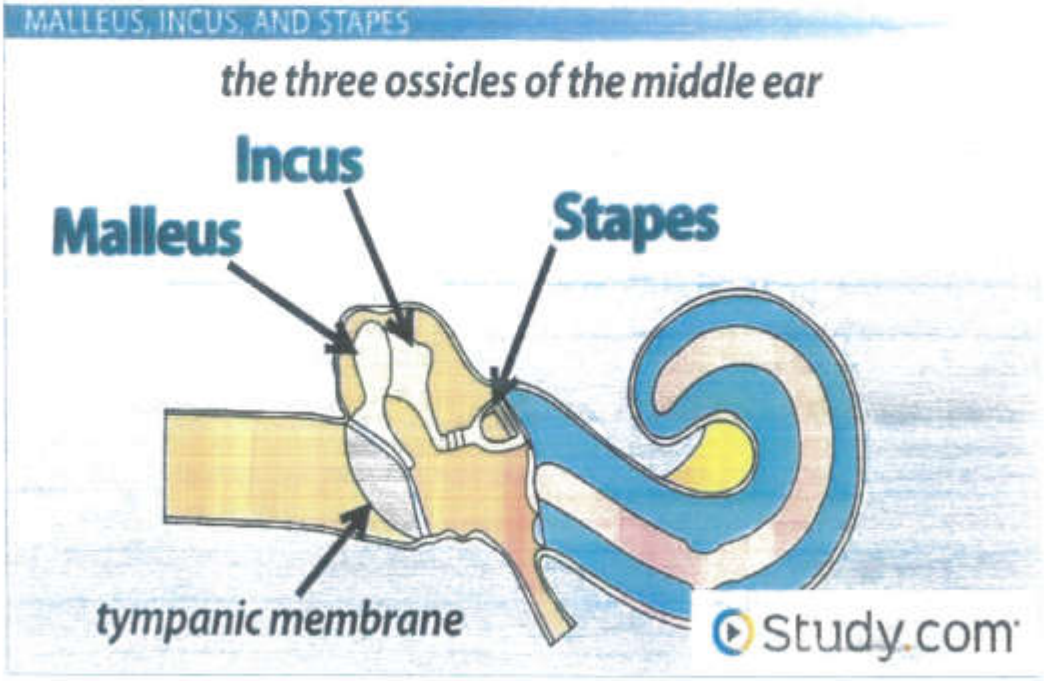
The audatory tube (Eustachian tube)

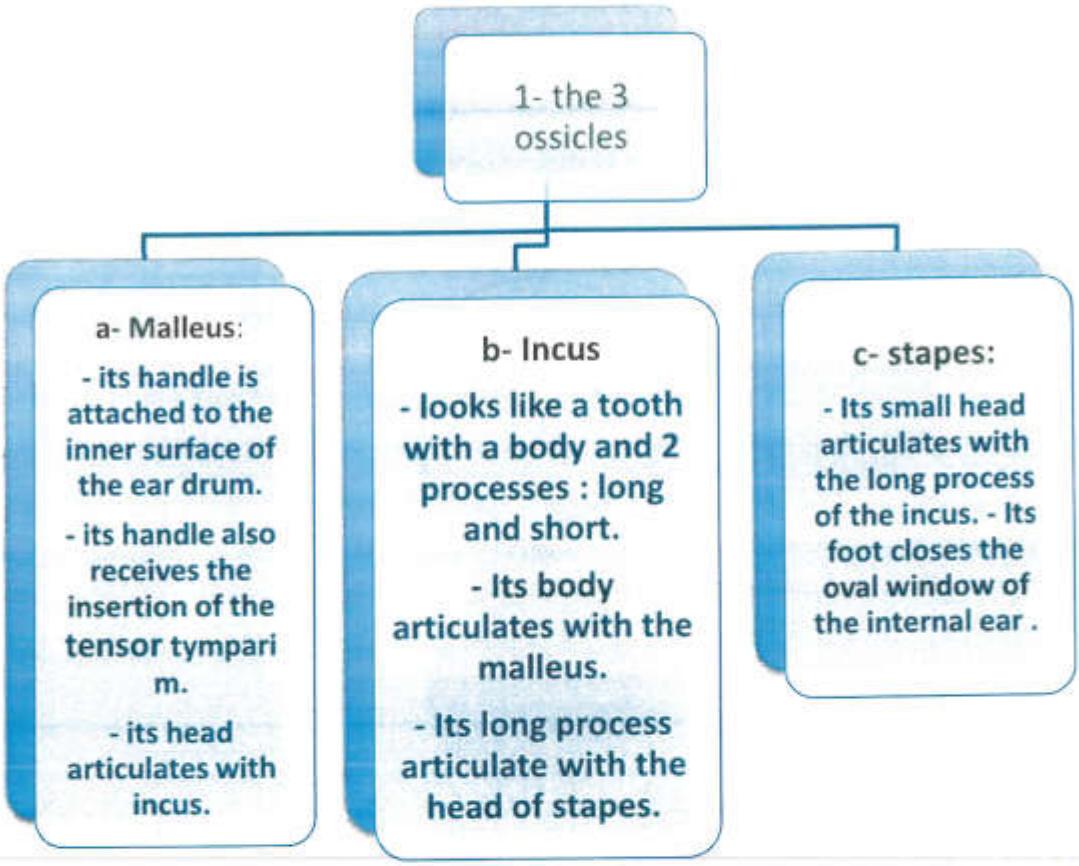
- It is a tube extending between the anterior wall of the tympanic cavity and the nasopharynx.
- Its proximal one third is bony, while its distal two third are catilaginous external auditory)(compare with meatus
- Its function is to equalize the pressure on either side of the tympanic membrane.
- *Nerve supply*: from the tympanic plexus and the pharyngeal br. of sphenopalatine ganglion .



ADAM


1- 3 ossicles
4- Air.
Content of middle ear
2- 2 muscles.
3- 2 nerve.


MALLEUS, INCUS, AND STAPES
the three ossicles of the middle ear
Incus
Malleus
Stapes
tympanic membrane
Study.com


1- the 3 ossicles
a- Malleus:
- its handle is attached to the inner surface of the ear drum.
- its handle also receives the insertion of the tensor tympani m.
- its head articulates with incus.
b- Incus
- looks like a tooth with a body and 2 processes : long and short.
- Its body articulates with the malleus.
- Its long process articulate with the head of stapes.
c- stapes:
- Its small head articulates with the long process of the incus. - Its foot closes the oval window of the internal ear .

Muscles	Origin	Insertion	N. Supply	Action
Tensor tympani	From the cartilaginous part of the Eustachian tube.	It turns in a small bony canal which opens into the ant. Wall of the middle ear cavity then becomes inserted into the handle of malleus.	Br. From the n. to med pterygoid m.	Pulls the tympanic membrane in wards protecting it from excessive movement.
Stapedius m	From the inner walls of the pyramid of the post. wall of the tympanic cavity .	Into the post. aspect of neck of stapes.	Nerve to stapedius from the facial n.	Damps down excessive movements of stapes.

These two muscles produce an action of damping down intensity of high pitched sounds.

The nerves inside middle ear:

1-Chorda tympani .
2-Tympanic plexus .

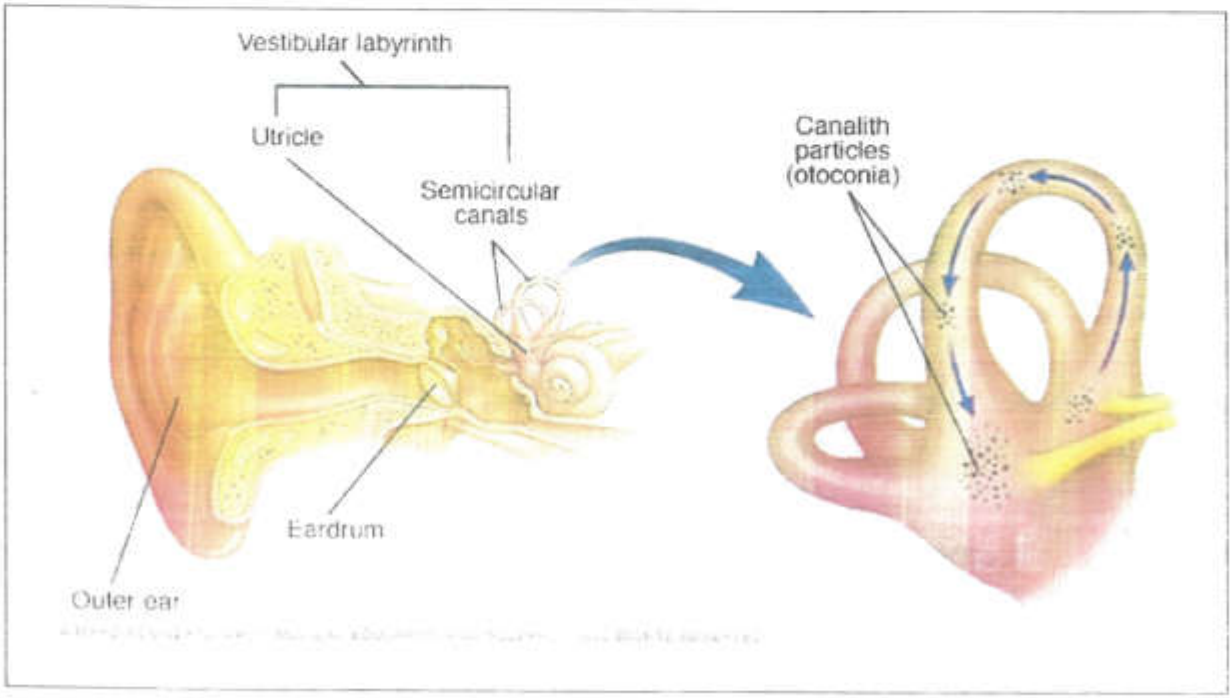
Lymphatic drainage:

The lymphatics of the middle ear and mastoid antrum drain into parotid lymph nodes and upper deep cervical lymph nodes.

Arterial supply of the middle ear :

1-Ant. Tympanic a. (br. Of maxillary a.)
2-Post. tympanic a. (br. of post. auricular a.)
3-Sup. Tympanic a. (br. of middle meningeal a.)
4- Inf. Tympanic a. (from ascending pharyngeal a.)

The inner ear



The inner ear lies within the petrous temporal bone (medial to the middle ear).

It consists of bony labyrinth and membranous labyrinth.

Bony labyrinth

Vestibule:

it is the central part of the bony labyrinth.

cochlea:

it resembles a snail which is formed of central modiolus and around it a hollow bony tube forming 2 3\4 turns.

Semi-circular canals:

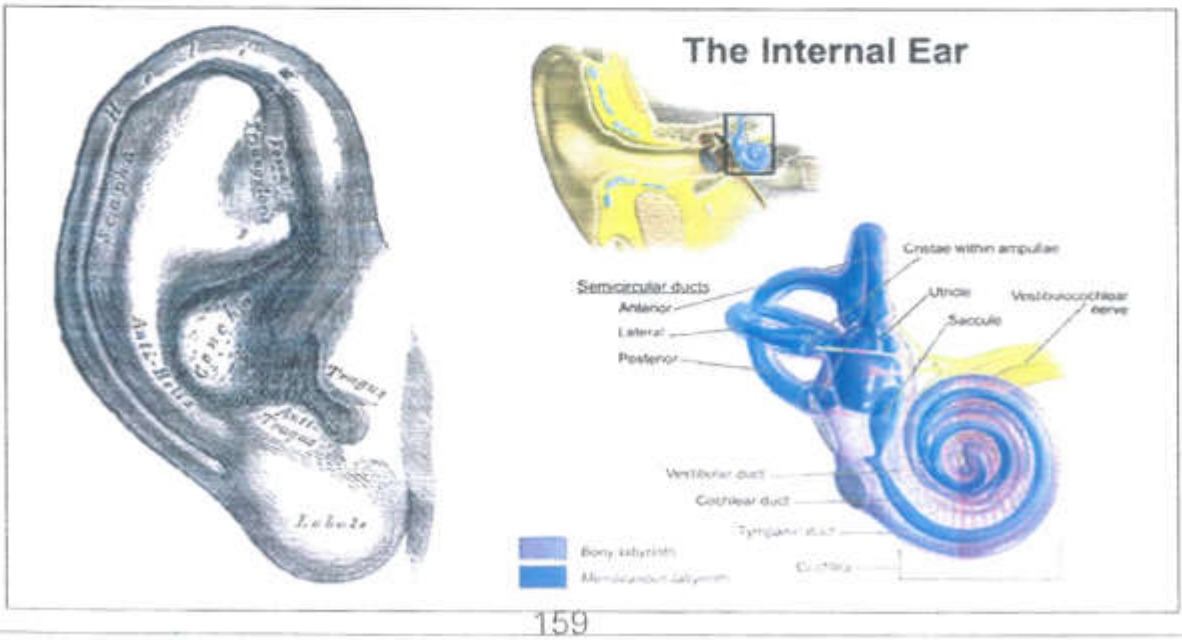
they are posterior and open into the vestibule. they are 3 in number (superior, posterior and lateral).

- they contain perilymph in which semi -circular duct are suspended.

Membranous labyrinth.

It is susbended within the perilymph and filled with endolymph.

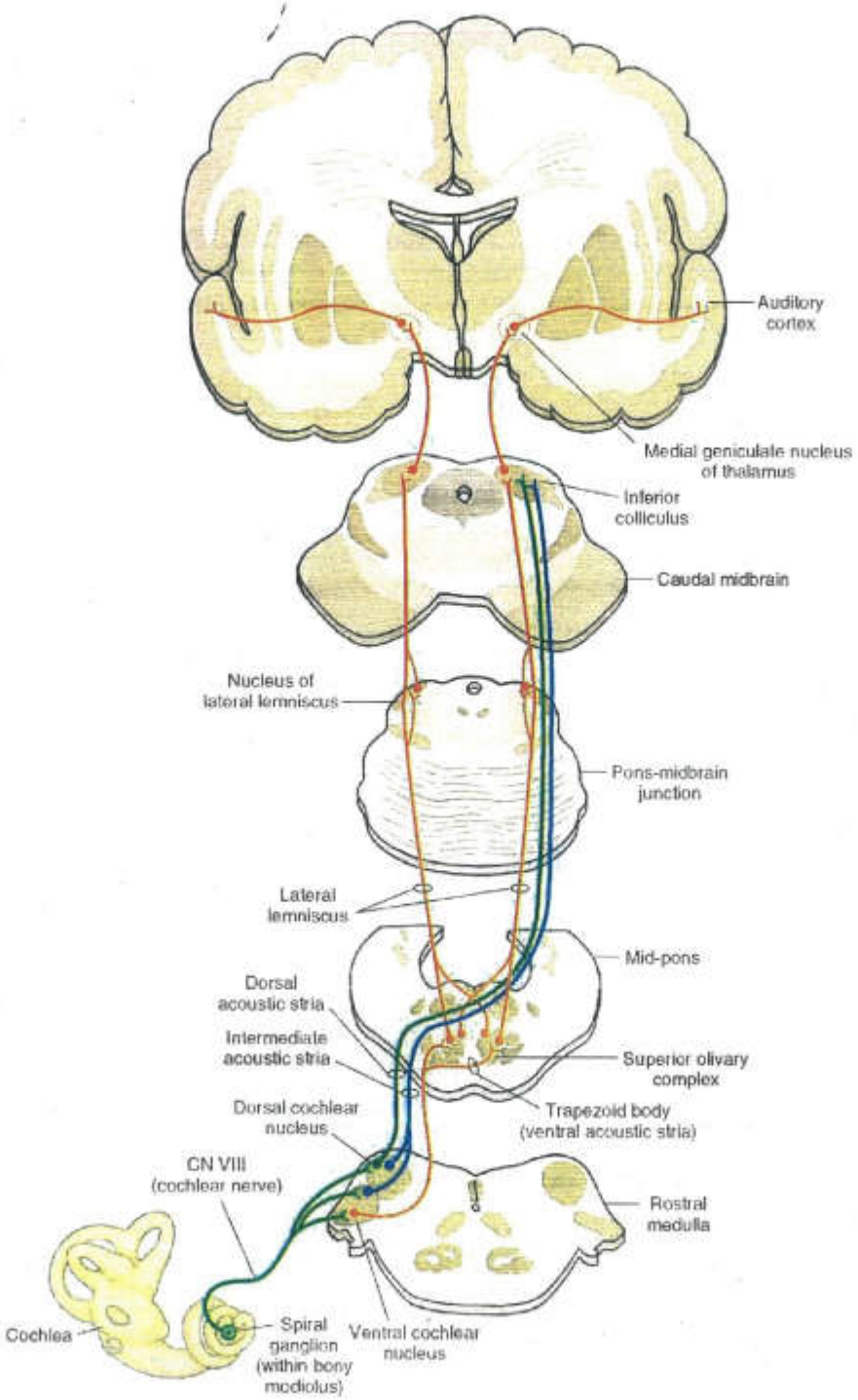
- Utricle and saccule: in side the vestibule.
- Semi-circular ducts: in side semi-circular canals.
- Cochlear duct: in side the bony cochlea.



AUDITORY PATHWAY(AC SLIM)

Auditory nerve	it goes to	Cochlear nuclei
From cochlear nucleus	it goes to	superior olivary nuclei
From superior olivary	it goes to	lateral lemniscus nuclei
from lateral lemniscus	it goes to	inferior colliculus
from inferior colliculus	it goes to	medial geniculated nuclei

then it makes hearing radiations which goes to temporal lobe (hearing center in the area 41,42)


Auditory cortex
Medial geniculate nucleus of thalamus
Inferior colliculus
Caudal midbrain
Nucleus of lateral lemniscus
Pons-midbrain junction
Lateral lemniscus
Mid-pons
Dorsal acoustic stria
Intermediate acoustic stria
Superior olivary complex
Dorsal cochlear nucleus
Trapezoid body (ventral acoustic stria)
CN VIII (cochlear nerve)
Rostral medulla
Cochlea
Spiral ganglion (within bony modiolus)
Ventral cochlear nucleus